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EDITORIAL NOTES—GAS, &c.

Compulsory Purchase.

BEFORE its close, this session will have given birth, in the Pontefract Corporation Act, to a clear case of parliamentary sanction to the compulsory purchase of a statutory gas undertaking. This has not occurred through any remissness on the part of the Pontefract Gas Company or their professional advisers. In their own interests, the Company fought well; in the interests of not only the Company but of the common interests of statutory gas companies, Mr. Corbet Woodall brought tactful and well-directed argument to bear upon the matter. But it did not avail. After his evidence before the Lords Committee, the trivial objections to the Company's proceedings and the paltry complaints put forward by a Corporation yearning for the possession of an undertaking that is—according to their evidence—tottering to its very foundations through mismanagement, had, in the opinion of those capable of judging from intimate and not distant knowledge, been completely demolished. It would be waste of time now to traverse the extravagant allegations of the Corporation, or to make specific reference to the rebutting evidence given on behalf of the Company in defence of their interests. There is not, looking at the evidence in a judicial spirit, the slightest ground for dispossessing the Company of their property; but there are grounds for saying that Parliament have not, having regard to the present management of the concern, considered the future welfare of the consumers in investing the Corporation with the power of compulsory purchase. The decision is indeed one of grave concern to private enterprise in gas supply, in view of the stimulating effect that it is almost sure to have in municipal circles in these times of socialistic proclivity.

In connection with the projected purchase, there are one or two incidental matters to be noted. The transfer clause provided for only a single arbitrator, and that each party should be represented by one Counsel, and one engineer and accountant as expert witnesses, in addition to any permanent officers of the parties. As it is understood (according to Mr. Lankester) that Mr. Corbet Woodall is not willing in future to be called as a witness in arbitration cases, the Company were not prepared to accede to the single arbitrator condition, as, unless Mr. Woodall represents them as arbitrator, they would lose his services. The result is that the arbitration, failing the agreement of terms, will pursue the ordinary course under the Lands Clauses Acts. The compensation clause for officers appears to place a large amount of power in the hands of the purchasing authority. There is to be compensation if the Corporation are not willing to retain the officers in their service. The option is entirely on the side of the Council; and the officers will have to repose a great deal of trust in the Council as to the duration of their retention. Provision for compensation to the Directors was, however, declined by the Committee.

Procedure at Westminster.

WITHOUT revealing any political partiality, the question of parliamentary procedure is one over which editorial liberty may be claimed. The Mother of Parliaments is far from being a perfect entity; and the periodical attempts to cause her to amend her ways partake somewhat of a piece of patchwork the components of which have an awkward manner of breaking apart, and causing fresh trouble. The modes of procedure have been attacked, criticized, and changed in minor respects in many successive Parliaments; but nothing that is done appears to bring about any material and permanent improvement, save perhaps in the hours of the twenty-four that our legislators are called upon to devote themselves to public business. This applies without distinction of Government. In the waning years of the last Government things were bad—in sooth, very bad; but they are drifting to a worse condition now. With so many novices in the Commons to-day, we have an attenuated verbosity which prevents progress, denies commonsense examination, and keeps the House of Lords from exercising their judicial and revisory functions. Year after year the Lords complain of the undignified treatment to which they are subjected, and to which they in turn are bound to submit Bills, through having them sent to them towards the close of the parliamentary session. This session things are unprecedented in this respect; and there has been serious complaint, because there are Bills of such public importance now in Parliament that the Lords will be committing an egregious wrong if they do not treat them to an inquisition of a very complete character.

The King's Speech, at the opening of the new Parliament, comprised a programme luxuriant in complex subject-matter. There were a round dozen of projected public measures, seven of which were of exceeding importance, either for their excellence or contrariwise. But here we are in the middle of July—Parliament proposing to adjourn early in August, and to reassemble for an autumn session; and as yet not one of the seven measures referred to has reached the House of Lords, and only two out of the five that are relatively of small importance. In three or four of the twelve subjects that it was thought demanded immediate legislation, managements of gas undertakings, as large employers of labour and substantial ratepayers, take something more than a languid interest. There are the Trades Disputes Bill, and the one for the amendment of the Workmen's Compensation Acts, as well as the projected measures for the amendment of the Unemployed Workmen's Act, and for developing the system of rates equalization in the Metropolis. What are the conditions of these measures? The Trades Disputes Bill will only be advanced to the Committee stage in the Commons before the August adjournment, unless pressure from the Labour Party forces greater progress; and the Bill for the amendment of the Compensation Acts is not to receive further consideration during the remainder of this part of the session. The Bill for the amendment of the Unemployed Workmen's Act has not been introduced; and a statement upon it is promised by Mr. John Burns. In the proposal for further facilitating the equalization of rates, the Metropolitan Gas Companies have a very large concern. It is a big and difficult problem, as while it seems hard that certain districts should have, under the equalization system, to contribute to spendthrift boroughs over whose administration they have no control, on the other hand it would be hard that poverty-stricken areas in our great composite Metropolis should not derive some succour from those parts not similarly afflicted. But equalization may mean additions or recisions of pence in the rate poundage; and therefore equalization may mean much to each separate Gas Company. But the Bill to deal with this subject has not yet been introduced, and is not likely to be this session.

It is plain that excessive ambition is going to spoil the first crop of the new Parliament. It is also equally plain that there must be some radical reformation in procedure other than the application of the guillotine if really useful public work is to be accomplished. But hopefulness for an immediate better condition is not a strong growth. Also of great seriousness in its degree is the procedure connected with Private Bill legislation; but for its reformation nothing of a practicable nature has ever yet presented itself. When it does, it will have to be extremely comprehensive in its scope; for nothing partial will suffice. No one can defend a system of procedure in effecting legislation that calls upon a Company to appear before Parliament four years in succession, and spend £10,000, as did the South Suburban Gas Company, to get piecemeal what they first asked for, and to end by securing practically all that was sought at

the outset. Nor can anyone justify the repeated fighting that has been necessary to get—this is a result of the present session—parliamentary sanction to the widening of Blackfriars Bridge and the bringing of the tramways over it; and report says, whether truly or not we cannot say, that the realizing of this power has cost nearly as much as the widening of the bridge will itself involve. The final passing of the schemes used as illustration is significant of original merit; and if they are worthy of acceptance now, they were equally worthy, notwithstanding opposition, when first introduced to the notice of Parliament. When such instances as these are considered, and the lamentable waste involved is taken into account, much virtue is found in the contention of those who hold that special matters, requiring any technical knowledge for their proper appreciation, demand specially constituted Committees, with expert assistance. But a difficulty would be to get experts who have not their own conceptions, prejudices, and caprices; and a Committee of all experts would not be the best conceivable body for the settlement of financial questions.

While dealing with Committee work, there is yet another matter which constitutes a notorious defect in the present system of conducting cases before Parliamentary Committees, and one which is unavoidable under present circumstances. It is the fitful attention that a plurality of engagements allows some of the leaders at the parliamentary bar to give to the interests of their clients while Bills are being prosecuted before Committees. There was a case only the other week where a Gas Company sought for a protecting clause. A brilliant opening was made by their leading Counsel, and after cross-examining certain witnesses, he vanished from the scene, leaving the case towards the close—just at the critical time—to a junior who had only been instructed the previous evening, and had not been in the Committee room during the opening of his leader. The protecting clause was not obtained. Another Counsel was consulted, and he advised that, excellent as was the Gas Company's case, owing to the misfortune in the first House, there was an uncertainty of winning in the second, and a second loss would rather lead the public to imagine that the Company were pursuing a vexatious course. This is not an isolated case. Experience brings to mind several others where the floundering of incompetent juniors—they are not by far all of the same genus—has been disastrous. It is a phase of procedure before Committees that falls within the need of reformation at Westminster—a need which does not show any signs of subsiding with passing time.

Sulphate of Ammonia Committee's Report.

The Sulphate of Ammonia Committee have now had nine years' existence; and it must be agreed that the Executive have during that period devoted themselves most energetically to demonstrating the value of sulphate of ammonia, and to publishing intelligence as to its merits among possible users. At the time of the formation of the Committee in the summer of 1897, the price of sulphate of ammonia was abnormally low—between £7 and £8; and by a year later it had risen to within £2 of the price at which it stands now, and which is in the neighbourhood of £12. It must not be forgotten that the purpose of the Committee is not the single one of spreading information for developing the sulphate of ammonia market, but there is the further object of resisting any injurious result from the activity shown in the interests of competing fertilizers. The report of the Executive, extracts from which are published in our news columns, exhibits no abatement of experimental and advertising work, but, on the contrary, new ideas are being brought to bear, and the Committee are getting into more direct communication, by personal means, with different users of sulphate of ammonia. The Committee have been busy during the year in obtaining new subscribers, and have been rewarded by a measure of success. But the report emphasizes a point that we made last year when urging gas undertakings unrepresented on the Committee to identify themselves with the work. "Among the new members are," says the report, "some of the most important iron and coke-oven "undertakings in the kingdom." The work of the Committee is, of course, mutually advantageous to all producers of sulphate of ammonia; but nothing more need be said than that there is some advantage in keeping "one's end "up" on such a Committee. The hint ought to be taken by those gas undertakings that are still non-subscribers. The Executive urge members to obtain new subscribers. This is important, as the constantly increasing production by industrial expansion, and invention busy with means for developing yield in various directions both external to and within the gas industry (even in the vertical retort), necessitates new or enlarged outlets. With the considerable increase in production, therefore, it is (the Executive say) "most "essential that funds should be provided for increased efforts "on the part of the Committee." We agree; but it is difficult to reconcile one action of a year or so ago with this very proper statement, which is tantamount to an appeal. The wisdom of reducing the subscription from 5d. to 4d. per ton of production was questioned in our comments last year; the fact that it is "most essential" that further funds should now be provided for increased efforts confirms the view then taken. We hope that, in next year's report, the Executive will have the gratification of announcing that many more gas undertakings manufacturing sulphate of ammonia have become subscribers to work that has had, and must have, a beneficial effect in protecting as well as enhancing common interests. Supposing the sulphate of ammonia market had been left in the past ten years without the protective influence exerted by the operations of the Committee, and the patronage of the users of fertilizers had been left entirely to the cultivation of competitors. What would now be the position of sulphate of ammonia?

The Rates of London.

In view of the special report made by the Select Committee of the House of Commons on the London County Council's scheme for the supply of electricity in bulk—which, reading between the lines, conveys a severe condemnation of the methods of procedure of that body, but recommends that another chance should be given to it to produce a comprehensive and really acceptable Bill for the carrying out of a project which is to involve the expenditure of many millions—the discussion in the House of Lords on Monday last week on the Council's Money Bill is of very special interest. This is a Bill for conferring on the Council additional borrowing powers to the extent of upwards of twelve millions sterling; and, as observed by Lord Camperdown, its presentation afforded the only opportunity to that august chamber to review the expenditure of the County Council. It is as well that there should be such a review by an entirely independent body; though it may be equally desirable to bear in mind that the part of a critic is a comparatively easy one. At the present time, the stock criticism levelled at the Council is the failure of their steamboat service to prove remunerative; and full use of this was made by Lord Camperdown. It was not, however, difficult for Lord Welby, as the Chairman of the Finance Committee of the Council, to point out that this was the only one of their undertakings in the nature of municipal trading which had not yet proved successful; while in the view of Lord Monkswell this was an experiment which had been demanded by public opinion. It is true also, as stated by Lord Welby, that the Press and the public are very exacting in their demands on the Council. Nevertheless, there is an uneasy feeling, which found full expression in this debate, that money is being spent too freely. It cannot be without very good reason that the credit of the Council stands lower than that of Birmingham, Manchester, or Liverpool, whatever may be thought of the suggestion of Lord Lansdowne that this is because the former are constantly making applications for fresh loans, and nobody knows what other obligations there may be lying behind those scheduled in their Bill. On all sides the hope was expressed that Lord Welby's influence might have a restraining effect upon his colleagues, and that in this direction his hands might be strengthened by the discussion. But whether it will have this desirable result remains to be seen.

In this connection, the return recently issued by the London County Council showing the amount in the pound of all rates made in the Administrative County of London in respect of last year, compared with the rates made in previous years, conveys a warning which ought not to pass unheeded. It shows that during the last nine years there have been increases in all the boroughs, varying from about 8d. to 3s. 9d.; the last-named advance relating to the now notorious borough of Poplar, although Stepney and Bermondsey are not very far behind, while Battersea figures for an increase of 1s. 9d., and Camberwell for one of 2s. Over the rate for the previous twelve months—1904-5—there have

been increases in all the boroughs except Holborn, Islington, Paddington, St. Marylebone, and Westminster; and here decreases have been recorded. In Poplar, the increase for the year was nearly 2s., while in St. Pancras the amount remained stationary. It cannot be without significance that the increases are greatest in the most democratic or progressive boroughs, which, consequently, enjoy the not very enviable distinction of being the most heavily rated. This might be set down to circumstances beyond the control of the spending authorities, as, for instance, the needs of education, and the lack of employment pressing heavily upon a working-class population; nor can it be doubted that the inequality of such incidences as these calls for redress in the shape of a really practicable scheme of equal rating.

There is, however, too much reason to fear that, in some degree at any rate, these heavy additional burdens are to be attributed to extravagance and recklessness on the part of the spending authorities, who are not always imbued with a just sense of their responsibility. We have no desire to anticipate what may be the result of the Poplar inquiry now proceeding; but the revelations already made call loudly for much reform in this particular administration. Unhappily, the mischief does not end with the impoverishment of the struggling tradesman or the city clerk to provide luxuries for the undeserving or corrupt; it results in permanent injury to the neighbourhood, through the enforced removal of industries which are essential to its welfare and prosperity. The transference of Messrs. Yarrow's shipbuilding works to the Clyde is a case in point. It is the inevitable outcome of high rating, especially if this is the result of unnecessary, not to say fraudulent, expenditure. There is, however, another class of expenditure which, although bearing somewhat heavily upon the ratepayers, is nevertheless desirable and necessary in the interests of the inhabitants. Whatever tends to improve the conditions of life in our crowded neighbourhoods, and to ameliorate the lot of the masses, is worth doing, if it can be done at not too great a cost. There is undoubtedly reason to believe that much of the increase in rates during recent years has been incurred in the endeavour to keep pace with requirements in this respect, which tend to grow more and more exacting. None the less, it is very desirable that a searching inquiry should be made into the causes which have led to these large increases of expenditure, and also that the object for which expenditure may be legitimately incurred by Local Authorities should be clearly and unmistakably defined.

The Length of Municipal Loans.

Since the Local Government Board and Parliament have made the sensible discovery that the periods at first allowed to municipal electricity undertakings for the repayment of loans were considerably beyond the length of the life of certain parts of the plant, there has been quite a revolt against the shortening of the terms of repayment on the part of municipalities and their officials, who, to make things look as prosperous as possible in the present, are not at all fastidious as to how much debt they pile on posterity. "What do I care about posterity," exclaims the electrical engineer. The time will come, without Parliament and the Local Government Board adhere tenaciously to their present policy, when posterity will reply, "What care we "for your antiquated fads and fancies and decrepit plants." The attitude of municipalities over this question was well and tersely expressed by Mr. Chatterton, a member of the Huddersfield Town Council, at the annual meeting of the Municipal Electrical Association. He said that it seemed to him that everyone wished to get into debt as fast as possible, and to get out of debt only at the last moment. For his temerity, he brought quite a shower of rebuke upon himself. But he spoke the truth, and no one denied it; though all found narrow sideways from which to attack the honest councillor. The matter is one of considerable importance to Gas Companies who are large ratepayers; and it is brought even closer home to them by the fact that local authorities are now raising the cry that this shortening of repayment periods for loans for electrical purposes is putting an advantage in the hands of the Gas Companies. If this is the strongest argument that can be advanced in behalf of extended periods, it will not serve its purpose. Municipal trading must justify itself by irreproachable finance, and any toleration of irregular finance in the present must end disastrously. Such irregularity has a tendency to develop, not to diminish.

Previous to the meeting of the Municipal Electrical Association, the Council had met with two rebuffs in essaying to make some move to convict the Local Government Board of error. They approached the Law Committee of the Association of Municipal Corporations, and placed before them reasons why an equated period of 25 years should not be departed from in the downward direction, and urged their co-operation in approaching the Local Government Board. But the Council of the Association of Municipal Corporations did not feel justified in taking steps; the fact of the matter being that the President of the Board had already declined to receive a deputation from them on the subject. Where the Association of Municipal Corporations failed, it was hardly likely that an Association composed chiefly of the officials of a special trading department in municipal administration, would be more fortunate. However, they sought an interview with the President of the Board, with a similar result; but he promised to consider any statement that they might present in writing. Now a Special Sub-Committee of the Municipal Electrical Association who have for some time been considering the question of what would, in their opinion, be fair periods for loans for different plant, are in a state of disagreement over a proposal to ask fifteen years for cables. Even the electrical "doctors" cannot agree as to the efficient life of the subjects under their control. The recent practice of the Board appears to be to allow twenty-five years for machinery, five years for meters, thirty years for buildings, and twelve years for mains. What the Association would like would be the reversion to an equated period for equipment of not less than 25 years. But when the Board get such illustrations of lax finance as they have had lately at inquiries into loans for electricity purposes, it is time that they made a move towards correction. Delay would only aggravate the mischief already started. The London County Council are also doing something in much the same direction, in connection with loans to the Metropolitan Borough Councils; but not sufficient so far as machinery and mains are concerned. In respect of these, a period of 42 years is allowed; but for meters and house services, in the case of the Marylebone Borough Council just recently, a term of ten years was granted. This the Council think insufficient; and they are now agitating to get the ten years extended to 42.

It is earnestly to be hoped that the Local Government Board and the London County Council will not listen to the importunities of municipalities for relaxation. Nothing but well-fortified reasons could have changed the practice of the former; and nothing but reasons equally strong ought to be allowed to cause a reversion to discarded practice. Perhaps there is one—and only one—extenuating circumstance to be found for the attitude of the municipalities towards the shortening of these electricity loans. Prior to commencing the running of electricity works, they had only been accustomed to structures and works that had a longevity that allowed of considerable repayment periods, and custom is hard to modify when conditions change.

Gas Affairs in Manchester,

The outstanding feature of the report and accounts of the Manchester Gas Committee for the past twelve months (full particulars with regard to which appear on another page of to-day's issue) is the increase that took place in the quantity of gas transmitted from the works. This amounts to 6·43 per cent., as compared with a trifling 0·08 per cent. the previous year, which, it will be generally admitted, is a very gratifying state of affairs—particularly in times like the present, when the word "competition" is so frequently heard. Of course, it has to be borne in mind that the consumers have had great inducements held out to them to use gas, inasmuch as the reduction in price of 2d. per 1000 cubic feet which was made in 1904 was followed by a further concession of 1d. as from June, 1905—which affected nine months of the past financial year. The satisfactory points of the report under consideration do not, however, begin and end with the increased output of gas. Among other things, the cost of coal, cannel, and oil per ton carbonized shows a reduction from 10s. 8·85d. to 10s. 4·74d. The number of engines supplied with gas by the Corporation continues to increase; the quantity of gas consumed in this way last year having been 7 per cent. more than the preceding twelve months. The total consumption by gas-engines is put down at 414 million cubic feet. These figures are, however,

overshadowed by those referring to cookers. The quantity of gas consumed last year by cookers is estimated at 426 million feet, or an increase of nearly 22 per cent. over the preceding twelve months. It will be noticed from the report that about 35 per cent. of the consumers now have the free use of a cooker or griller. The incomings and outgoings of a gas undertaking of the magnitude of that at Manchester are, of course, on an enormous scale. An income of close upon £700,000 resulted in a net profit of £90,000; but this sum, large as it is, was augmented by £29,000 transferred from the reserve fund. The comfortable sum of £50,385 is allocated to the city fund; but this by no means exhausts the claims which the gas consumers have to the gratitude of the city. In addition to the very big amount set aside for interest and sinking funds, the purchase-money for the portion of the Stretford Gas Company's property lying within Chorlton-cum-Hardy (£50,710) has been taken from the reserve fund—which fund was also called upon (in spite, it will be remembered, of the protests of Alderman Gibson, the Chairman of the Gas Committee) to pay the expenses, amounting to nearly £9000, incurred by the city in connection with the last Royal visit. With all these demands upon its resources, the Manchester Gas Department has need to do a profitable business.

Carlisle, and Salford.

The private gas-rental at Carlisle displayed on the present occasion a somewhat large falling off; though the influence of this on the accounts has been somewhat mitigated by a growth in the receipts from residual products. Even as it is, however, the gas profits are £563 less than on the last occasion. The adoption of electricity by some of the largest consumers, and the general coming into use of the incandescent mantle, are the reasons advanced for the falling off referred to in the private consumption. Under these trying circumstances, the Chairman of the Gas Committee suggests the adoption of heroic measures—that is to say, he thinks that the only way to keep up the private consumption "would be to reduce the price of gas by 2d. per 1000 cubic feet." What magic there may be about the particular figure of 2d. in this connection, we do not know; but certain it is that, what can be done to keep up the private consumption, will be best effected by a reduction in price. Lower charges for gas are generally heard of when profits are on an increasing scale; and it will be interesting to see if Carlisle has the courage to take this step on a shrinking credit balance. Of course, the fact that the plant is capable of turning out a much larger quantity of gas than is at present required, is an important point to be considered in deciding upon the policy that shall be adopted. Meanwhile, the Chairman of the Gas Committee has clearly given the members to understand that the reduction in price is at present only a suggestion; the Committee have not as yet contemplated taking such action. Salford, it is satisfactory to see, is on the same road as its neighbour Manchester. The sales of gas exhibit an increase of just over 3½ per cent.; the number of consumers being considerably larger last March than was the case twelve months before. The result of this prosperous condition of affairs has been the transfer of about £24,000—the net profit for the year—from the accounts of the Gas Department to the credit of the district fund.

Direct or Contract Work.

In considering the problem as to whether work can be carried out cheaper and better by direct labour or by the employment of a contractor, so many questions as to conditions and equipment in the individual case intervene to spoil any general determination, that it is impossible to lay down any universally applicable rule. Though there is a great amount of special work that contractors, from the mere extent of their operations, experience, and equipment, are far better able to carry out, both in respect of cost and excellence of result, than direct labour, there are undeniably many directions in which work can, in view of local conditions and requirements, be more advantageously executed by the employees of the administration than by contractors; and when this can be done without waste of money, then it is a good principle to follow that the money should be spent upon local labour. The waste of money is an important point, because experience of local administration has not convinced us that, in direct labour, a fair day's work is always obtained for a fair day's pay; and the same discipline does not, as a general rule, exist that is found among the servants of contractors. In the case of municipal employment on new work, the borough treasury is sometimes—drawing the conclusion from the rate at which work progresses—regarded as a fair object for sport on the part of those employed. But this is not always so; and, as we have said, there are works that ought to be carried out—and can be with proper supervision—even better by direct labour than by contract work. On this ground, we hope the Local Government Board have not adopted as permanent the policy of disallowing as a capital charge the payment for labour on extensions chargeable to capital when the work is performed by direct labour. This appears to have happened at Grimsby; though, without the full facts before us, it is impossible to say whether the work in question is not properly merely a revenue replacement and not a *bonâ fide* extension. In this instance, sanction was asked to a loan for electricity extensions; and the Board disallowed an item of £277 for the time of permanent employees at work on the extensions. If the extension was a proper capital charge, it would be regrettable if the Board made this distinction between direct and contract labour, because, in the case of the work being let out, the cost of labour would be included in the contractor's tender, and would not then be disallowed by the Board. The same thing might happen in connection with a municipal gas undertaking, or any other branch of local service.

The Lighting of the New Victoria Station.

Certain of our electrical contemporaries have shown some amount of chagrin over the adoption of high-pressure gas lighting at the new Victoria Station, as it is rather a big set-off to Charing Cross. The "Electrical Contractor" especially has been almost shedding tears over the matter, but editorial consolation is found in the idea that the Directors and Chief Engineer of the London, Brighton, and South Coast Railway overlooked flame arc lamps. This, of course, is a mistake. It may interest our contemporary to know that flame arc lamps were under consideration before high-pressure gas lighting was determined upon, and that, as a matter of fact, the Railway Company had used flame arcs elsewhere, and knew all about them. The "Electrical Contractor" is of opinion that the new station is "specially adapted for lighting by flame arcs, as the diffusion would be so much better [than what?], owing to it being possible to get the light much higher." The Railway Company will no doubt be duly grateful to our contemporary for the information. To prevent shadows, 360-candle power gas-lamps are placed between each pair of columns. If flame arcs were not fixed in equal number and in the same situation, some very ugly shadows would be thrown by these very columns; and if flame arcs were so provided and placed, the cost would work out to something prodigious. But after devoting a whole column to small talk on the subject, our contemporary winds up with the remark that "gas lighting is only used on the platforms." As the platforms are about ¼ mile long, and as the station when completed will be illuminated by gas-lights equal in the aggregate to 140,000 candles, a very careful search will have to be made for the significance of the singular remark. Our contemporary does not very lucidly express itself in what it, with an admirable dash of boldness, calls "a reply" to the published statements concerning the lighting of Victoria Station; and the readers of the paper cannot do better, in the interests of gas lighting, than take the advice of the Editor to make known the "reply" as widely as possible.

New Plant at Devonport.

The inauguration of the carburetted water-gas plant at the Devonport Gas-Works last week may be regarded as the definite closing of an episode in the history of the undertaking which no one can look back upon with satisfaction. That the plant is actually erected and has been in operation for some months, without any suggestion of complaint from the consumers or from those who reside in the neighbourhood of the works, may be taken, as Alderman Hornbrook claims, to fully justify the policy of those who insisted upon the adoption of this particular method of gas manufacture. At the same time, it is open for their opponents to say that the system they advocated would have been equally successful if it had been tried. The real success of the Gas Committee's policy has, however, been reached in establishing the harmonious working of the gas undertaking. It is in the interest of the consumers and of the town in general that there

should be perfect confidence between the Committee and those who are immediately responsible for the carrying on of the gas business. Sir Joseph Bellamy let fall some remarks on this subject which are very much to the point. Experience has shown in numberless cases that municipal undertakings are most successful when a great deal of confidence is reposed in the responsible officials, and when they are given a reasonable amount of latitude. Many a good man has had the heart taken out of him by the carping criticism and petty interference of men who do not possess a tithe of his ability, and have none of his opportunity of really weighing the advantages of divergent courses of policy. Mr. Buckley, the present Engineer and Manager, is in the happy position of being on very good terms with his Committee. They express full confidence in him, and he has found them a reasonable body of men to work with. It can only be hoped these happy relations will continue; for the Devonport Gas Committee are by no means at the end of their capital expenditure. It may be possible, by the aid of the new water-gas plant, to carry on for another winter or two; but the time is not distant when a new retort-house must be built. Great improvements have been effected at the works since the Corporation acquired them. A new purifier-house and a gasholder have been erected; but the retort-houses are deplorably inefficient, cramped, antiquated, and ill-adapted for economical working. It appears to be the opinion of the present Gas Committee and their Engineer that the new gasholder is a superfluity, and that with the means of rapid production provided by the water-gas plant it might have been entirely dispensed with. If this is the case, it is a pity the money was not devoted to the erection of a new retort-house, which is indispensable if the cost of manufacture is to be reduced.

One Cause of the Failure of Municipal Trading.

Truths are sometimes unpalatable; and one that must be very much so to municipal authorities is to be told that it is largely owing to the unfitness of a dominant number of their members that municipal trading in many places is a failure. Mr. Joseph Chamberlain, M.P., in one of the speeches he recently made at Birmingham in connection with his septuagenary celebrations, said this:

> If complaint is made, and I think it is made justly sometimes, that our local administration occasionally falls off from the high ideal which it ought to keep always before it—if there is inefficiency, ignorance, extravagance—the fault does not lie with those great democratic institutions which express so well every form of public need and public opinion, which give such full opportunity to every class, to every kind of ability. It does not lie with them—it lies only with those who, having advantages which may have been denied to others, advantages of influence, and wealth, and education, refuse or fail from indifference to place their talents at the disposal of the community, and leave all this great work to be accomplished by those whose willingness is, perhaps, greater than their capacity to perform it.

Mr. M. E. Ingalls, the President of the Commission sent from America to this country for inquiry purposes into municipal trading and company enterprise, in the course of an interview with a "Standard" representative, has also given expression to somewhat similar views. The men of good ability in America, he said, have their time fully occupied in managing their own affairs; and, for this very reason, conditions are distinctly adverse to municipal ownership. He acknowledges that the Commission have found in this country many instances of private companies doing the work of the public with equal efficiency to municipal authorities; and he instances the gas-works visited in London. It is curious that Monarchical England is so much more inclined to Socialism than Republican America, where the people are remarkably individualistic.

Industrial Freedom League.

In spite of all that the pro-municipal trading Press may have to say on the subject, there was a very great deal of good sound commonsense in the speeches made at the annual meeting of the Industrial Freedom League last Thursday. It is not, of course, possible for us to give anything like a full report of the proceedings; but an indication of some of the main points raised is given in another column. Though the names of those actively connected with the League afford ample proof of the fact, the Chairman (Sir Felix Schuster, Bart.) emphasized the point that the movement was altogether of a non-political character. There is, of course, no reason whatever why an organization having such objects as this should have anything about it of a Party nature; and, indeed, it is a little difficult to see why politics should be introduced at all into municipal affairs. The questions with which the League deal affect all classes of the community, and people of every shade of opinion. The main point of the whole controversy is to be found in the rising rates; and more than one speaker at the meeting showed, beyond all possibility of logical contradiction, how closely concerned is the working man with any question relating to rates and taxes. Though he may pay indirectly, he still has to bear his full share of municipal expenditure; and it is well that he should be under no illusion as to what this share really amounts to. There is therefore much to recommend the resolution passed, to the effect that every tenant whose rates are compounded for by his landlord should be informed of the amount included for such rates in his rent. It was pointed out by the mover that something to this end might be accomplished without legislation, if landlords, in their application notes and receipt forms, could be persuaded to divide the amount paid for rent and that paid for rates. Another matter which occupied the attention of the meeting has on numerous occasions been referred to in the "Journal," and is one that calls urgently for redress—namely, that parliamentary and joint-stock companies have to contribute heavily to the rates without being permitted any voice whatever in the raising or the spending of the money. That taxation and representation should go together does not seem anything more than can be fairly asked by the victims of the existing state of affairs. The suggestion was thrown out at the meeting that a deputation should be formed to wait on the Local Government Board, so as to see whether any help can be secured from them towards the attainment of this end; and, if it did nothing else, such a step would doubtless have the effect of still further drawing public attention to the hardship which it is desired to remedy. Lord Avebury's views on municipal trading are well known; but particular attention may be drawn to the portion of his speech in seconding the adoption of the report and accounts of the League in which he set forth the five principal objections to this policy and his arguments in support of them.

Power from Waste Gases.

To Mr. H. E. Wimperis, Assoc.M.Inst.C.E., has been confided an investigation by "The Times" as to the extent to which waste is proceeding year by year from the residual gases of coke-ovens and blast-furnaces. The result of his inquiry is published in the Engineering Supplement of our contemporary for July 4. The first result of his reckoning is that from waste gases of coke-oven plants of this country could be produced not less than 300,000-horse power. This calculation is made on the estimated consumption of hard coke last year being 10 million tons. The production of this quantity of coke would need 14 million tons of coal. On coking, this would give off about one-fifth its weight in the form of gas, of which about one-quarter would represent the surplus available for use in engines. This gives about 120 million cubic feet of gas per day, having a thermal value, in round figures, of 450 B.Th.U. per cubic foot, which is from four to seven times higher than that of the gas from blast-furnaces. From blast-furnaces, the residual gases would produce about 700,000-horse power, almost all of which is at present wasted. It therefore follows that, taking coke-ovens and blast-furnaces together, about a million horse power is being wasted. Regarding the important question of how much of this could be saved, Mr. Wimperis says this would depend upon the size of the gasholders used to make the supply to the gas-engines continuous, and upon the kind of ovens and furnaces used. The main question, however, is as to what advantage would accrue to metallurgists to produce immense quantities of power that they cannot utilize. The reply to this question must depend upon the extent to which local demands for power exist, or can be created. To transmit the power to any distance less than half-a-mile, it would probably be most economical to use pipe-lines for the conveyance of the gas; but for longer distances, electric transmission would be the obvious method to adopt.

The annual meeting of the Irish Association of Gas Managers will be held in Dublin on Tuesday and Wednesday, the 14th and 15th prox., under the presidency of Mr. R. Bruce Anderson.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 198.)

THERE was no improvement last week in the general position of things on the Stock Exchange; indeed, the situation was aggravated rather by the introduction of a new element of disturbance in the form of sinister rumours regarding financial instability in certain quarters. Baseless as these insinuations probably are, they had what we must suppose to have been their intended effect; and thus a rather brighter opening of the markets became overclouded with apprehension, and all the light was taken out of it. There was a general move to realize, and down went what little rise in prices there had been. On Saturday, Consols once more changed hands at 87⅞. It was account week, and the settlement was a rather delicate business; but it is believed that difficulties have been overcome. In the Money Market, there was a superabundant supply, upon which the requirements of the Stock Exchange made but little impression; and discount rates, after standing firm, had to relax before the close. Business in the Gas Market was no better than moderate; and it did not present any very special feature. None of the heavy issues was inordinately active; and several of the less conspicuous ones came into notice. There were not many changes in quotation; but some of the more important issues which give character to the market improved in value, and imparted a good tone generally. The few retrograde movements observable were confined, as they had been in the preceding week, to South American stocks. In Gaslight and Coke issues, the ordinary was below the average in point of volume of transactions, and was very steady; the prices at which it changed hands ranging only from 98⅛ to 99. Dealings in the secured issues were only moderate. Nothing was done in the maximum; but the quotation was advanced a point. The preference was done at 109 and 110; and the debenture at from 86 to 86¼. There were a few dealings in South Metropolitan at from 129 to 130½ (a rise of 1 in the quotation); and the debenture advanced fractionally *ex div.* There were a few more transactions in Commercials; but stock continued scarce. The 4 per cent. was done at from 113 to 114⅞; the 3½ per cent. at 110 and 110½; and the debenture at 84½ and 85. The Suburban and Provincial group was as quiet as usual. Bournemouth "B" marked 17¼ and 17½ (a rise of ½ in the quotation), Brentford preference 125 special, ditto debenture 104, British 42 and 42½, and South Suburban advanced 2, without any business being done. In the Continental Companies, Imperial was moderately active at unchanged figures, transactions being between 177¼ and 179; and ditto debenture marked 97. Union ordinary was done at 125 free and 124 (a fall of 1 in the quotation); and ditto preference at 141 free. European fully-paid changed hands at 25 and 25½, and ditto part-paid at 19⅛. Malta marked 4½ and 4 13/32. Among the undertakings of the remoter world, Bombay was done at 6⅞, Buenos Ayres at 11½ and 11¾ (a fall of ¼ in the quotation), ditto debenture at 96⅛, River Plate at from 12¼ to 12 9/16, ditto debenture at 97, Primitiva at 6½, ditto preference at 5 3/16 and 5 5/16, and ditto debenture at 96½.

The closing prices are shown in our Stock and Share List on page 198.

ELECTRIC LIGHTING MEMORANDA.

Financial Condition of the Undertakings of Authorities and Business-Promoting Methods—Some of the Methods—Useful Hints—The Cost of Incandescent Electric Lamp Renewals—Free Renewal Advocated—Its Expense.

A NOT insignificant part of the proceedings at the recent meeting of the Incorporated Municipal Electrical Association was devoted to the consideration of means for promoting the development of electricity undertakings under competitive conditions. Two papers introduced the debate—one being by Mr. S. E. Fedden, the Chief Electrical Engineer of Sheffield, and the other by Mr. H. Collings Bishop, of Newport, Mon. It is noteworthy, and the compliment must be paid them, that both these gentlemen possess extremely enlightened views on how the business of an electricity undertaking should be developed; and it is equally remarkable that in both cases the undertakings that they control are not paragons in respect of financial success. In Sheffield, according to Mr. Fedden's last annual report, the gross profit furnished by the electricity undertaking was deficient by £1375 of the sum required to meet the financial liabilities. The last figures for Newport (1905-6) show that the undertaking only came out, after meeting capital charges, with a balance of £97, which is less than the year before; and no doubt everything was cut as fine as possible to show this balance, without, too, making any provision for the future. So that while these two Electrical Engineers essay to teach their fellows the ways they should go, their own undertakings do not give evidence of the ways having been very effectual. In the main, the business-development schemes advocated by the authors are those that are generally approved; but there is just one insurmountable obstacle to striking progress, and that is the cheap and all-round useful gas competitor. It was only the other day that Alderman Styring was saying at Sheffield that the great difficulty they had there was the extreme cheapness of the gas there; and both Mr. Fedden and Alderman Styring, loath to break the continuity of the plea that annually comes up with unfailing regularity, then urged the Council to let them have the lighting of the public buildings and the principal streets. But at the present time, except just a few electric lamps round about the City Hall, the whole of Sheffield is lighted by gas for the very reasonable sum of £12,000 a year. When the City Councillors cause the ratepayers to pay any more for the public lighting than is necessary to obtain efficient and sufficient illumination, then they will forfeit their right, as men of Sheffield, to the world-wide reputation for keenness in commercial transactions. The £12,000 would swell beyond recognition if the street lighting was handed over to the tender mercies of the Electricity Department, with its existing shortage of income.

With the example of the Sheffield Gas Company before him, Mr. Fedden has no difficulty in convincing himself that low tariffs and a progressive policy in dealing with mains extensions, together with a comprehensive system of street lighting, are the requisites—more so than advertising and canvassing—for the development of business. But as Mr. Fedden cannot have everything his own way, he submissively proceeds to consider several other means of pushing business, giving words of counsel first on the subject of judicious advertising. He then points out the usefulness of the distribution of printed matter, in the shape of leaflets and pamphlets, presenting particular rather than general information. Mr. Bishop, on the other hand, has great faith in the virtue of a beautifully illustrated and well-printed book of some 70 to 80 pages; in picture post-cards illustrating consumers' installations; and in making use of the local Press by obtaining publication of notable successes in the struggle with "the" rival. Both authors agree as to the usefulness of canvassing by a qualified man capable of advising on installation. But we do not know why Mr. Fedden should find it necessary to suggest that the electrical canvasser "must never be staggered by the inventive perversity of the gas man." This is an insult to the adversary of the gas canvasser. It hints at effeminacy; but from what we know of the gentlemen of the electrical canvassing calling, if their own perversity does not shock their consciences, the so-called perversity of the gas man will not give them any inconvenience. There is divided opinion on the subject of the value of local exhibitions. Mr. Fedden says that they have the objection that they do not attract the right sort of visitor, excepting at the commencement of the display; and he is supported in this by the experience of the Eastbourne Electricity Department. On the other hand, Mr. Bishop attests the great value of exhibitions; and he likewise has his supporters. The value of street lighting as an advertisement is made much of, but not too much. A hiring-out department, the undertaking of installation work, the establishment of a show-room, and the right of inspection of work carried out by contractors, all had their advocates, in the papers and discussions. These are antiquated suggestions, though in part most useful and legitimate methods.

Still there are to be gathered from the meeting a few hints that have rather more freshness about them. Mr. Fedden has had a demonstration table made and equipped; and this he finds very serviceable in lecture work before the local societies. Some time ago the Croydon Gas Company adopted the idea of supplying local ironmongers and fitters with gas at reduced rates for exhibiting lighting and other appliances in their shop windows. The proposal has a place in one of the papers for application to electricity supply. Mr. Bishop advises the supplying and guaranteeing of lamps, such as the Nernst, Tantalum, and Osmium, in order to popularize their use. As a matter of good generalship, Mr. J. F. C. Snell considers that electrical engineers ought to know what the enemy are doing; and so, in Sunderland, when new gas-lamps are introduced, he buys samples, and puts them under test. In this way he and his staff learn the exact life and candle power of the lamps, and know exactly what they have to deal with. But Mr. Snell was silent, so far as the reports to hand inform us, as to his experience with the lamps he has tested; so that it may be assumed they have been giving a satisfactory account of themselves. If they had not, such a fine opportunity for attacking "the enemy" would not have been allowed to slip. It is found to be of but little purpose to try to disparage incandescent gas lighting, when there are so many vivid contradictions all round. Alderman Coates (who was in attendance at the meeting from Hanley) admits that what is wanted are "better" electric lamps —both arc and incandescent—"in order to compete with gas." For not only do the initial cost of installation and the subsequent expense of electricity stem progress, but the knowledge of the deterioration of electric lamps, and the cost of their renewal and maintenance, weigh heavily on official electrical engineers.

With the progress of time, the disrepute which the decline in efficiency of incandescent electric lamps brings upon them does not lessen; and the administrators of electricity undertakings are continually trying to evolve a plan whereby they can assure consumers' lamps giving good results. Experience has shown that even the best and newest lamps on the market will not, through the variation of voltages, give a constant light; but that is an aspect of the subject to which electrical engineers do not publicly direct much attention. At the same time, the necessity for maintaining a good light on the consumers' premises is not ignored; and therefore in Mr. Fedden's paper he devoted a great deal of attention to the point as to the best means of escape from the odium brought upon electricity by the supineness of the consumer in giving proper attention to his lamps. Consumers, as a general rule, will not of their own volition

renew their lamps. When they have a brand new installation, it is looked upon as something that is going to endure for ever; and it is only after a three or four months' run that they find out their mistake. Then there is disappointment, and neglect. Electricians talk of the cost of gas-mantle renewals as though it was something alarming; but mantle renewals work out to nothing like the cost of the renewal of incandescent electric lamps. Mr. Fedden admits that a fair average renewal for electric lamps in private houses would be three times a year, and that the cost of each lamp would be 11d. In regard to the renewal of the lamps, if a man wants to get the best possible illumination, renewal three times a year is not by any means too often; and 11d. for a good lamp is a low figure. Prices, not of 11d., but of 1s. 1d. and 1s. 2d. each for respectable types of lamps are being paid in London; and 1s. 2d. × 3 = 3s. 6d. per point per annum. A private consumer with 30 lamps requiring renewal three times a year must therefore make up his mind that upon the top of his annual electricity bill, he will have to be prepared to meet renewals amounting to something like £5 5s. a year, unless he is content to sit in darkness and waste current. Not mentioning the cost of installation and the charge for current, incurring this expense, of (say) £5 a year for renewals is actually economical in electric lighting, seeing that there is a point when consuming electricity wastefully really becomes more costly than renewals. Mr. Fedden can see no way out of the difficulty but that free renewal of lamps should take the place of a reduction of price. The need for doing something in this regard must be pressing when it is Mr. Fedden who makes such a suggestion as this, seeing that he realizes so keenly how obligatory it is, in the face of competition, to get down as quickly as possible to a low charge for current.

Mr. Fedden takes a hypothetical case to ascertain the financial aspects of his system of free renewal. It is interesting; and his figures will be useful in giving halting householders information on the subject of electric lamp renewals. He supposes a lighting area having 2800 consumers; and the equivalent of 118,000 16-candle power lamps connected, with an annual consumption of 4½ million units. Reducing the 118,000 recorded lamps by (say) 10 per cent. to get approximation of the effective connections, the figure of 105,000 is arrived at, or an average of 37·5 lamps per consumer, with an average number of units consumed per lamp of 42·75. The average burning hours per lamp per annum would be 712. Separating the consumers into classes, Mr. Fedden finds that the frequency of change in the different divisions will be as follows:—

	Lamps. Each.		Changes of Lamps in Two Years.		
1500 private houses	23	34,500	6		206,000
300 shops (early)	65	19,500	2·7		52,600
700 shops (late)	65	45,500	5		228,000
50 halls and churches	100	5,000	1		5,000
4 theatres	500	2,000	4·8		9,600
20 public houses	50	1,000	6		6,000
450 offices	20	9,000	1		9,000
10 clubs and hotels	150	1,500	8		12,000
		118,000			528,200

With such big figures, the fact that Mr. Fedden has made a mistake of 1000 lamps in the number required for renewal purposes in private houses can be overlooked. Taking his figure, however, of 528,200, and dividing by 2, we get 264,100 as the number of lamps required per annum for the upkeep of the 105,000 effectual connections, which gives, over the whole of the classes, an average frequency of changing of five times in two years. In addition to giving all these lamps away, there would be the expense of organization, clerical work, testing, storage, stock-keeping, inspection, and testing of lamps. The total cost of this free renewal scheme the author puts at £5943 per annum —a heavy price to pay to keep the private lighting business together, and one which the Sheffield Corporation at all events cannot afford at the present time. A business having customers who require so much attention as this cannot be built on a very sure foundation. The alternatives of maintenance as practised by gas undertakings, and the giving away of a new lamp for a specified number of units of electricity consumed, do not appear to be effectual. But at the meeting, the slender notice taken of Mr. Fedden's free renewal proposal is an indication that it does not commend itself as a practical solution of the difficulty with which electricians have to deal. The renewal figures will be very useful to gas people; and we trust if Mr. Fedden hears of them being used, he will not attribute them to "the inventive perversity of the gas canvasser." The gas canvasser will give chapter and verse for his authority.

The Council of the Society of Arts have elected Sir Steuart Colvin Bayley, K.C.S.I, C.I.E., as Chairman for the current year; and Sir John Wolfe-Barry, K.C.B., F.R.S., has been chosen as a Vice-President, in place of the Duke of Westminster, who is unable to accept the office to which he was elected at the annual general meeting on the 27th ult.

An account is given in the "Gesundheits-Ingenieur" for the 23rd ult. of certain automatic contrivances for preventing the escape of gas from burners which may have been blown out or accidentally left open. The action depends upon arrangements which only permit of the flow of gas when a small vessel containing air has been heated by the gas-flame.

LORD AVEBURY AND OTHERS ON THE QUESTION OF MUNICIPAL TRADING.

THERE was a fairly large, and keenly interested, body of members present at the Westminster Palace Hotel last Thursday afternoon, when the fourth annual meeting of the Industrial Freedom League was held. The gathering was presided over by Sir Felix Schuster, Bart., who is well known in financial circles as Chairman of the Union of London and Smiths Bank. He was supported by Lord Avebury, Lord Claud Hamilton, the Chairman of the Great Eastern Railway Company, Mr. J. F. Mason, M.P., and others.

The first resolution proposed was for the adoption of the report and accounts; and this was moved by Sir Felix Schuster, who apologized for not having been able to prepare anything like an address for the occasion. He remarked that the principles of the League were nothing more than those of sound economy and sound finance, to which the country owed so much. It did not, he went on to say, imply any hostility to municipal undertakings if they maintained, as they did, that these had been carried to excess—that there were limits which must be imposed, limits that the state of the Money Market imposed on such borrowing. It was useful concerns that suffered from an excess of borrowing in connection with undertakings not for the public good. Private enterprise was the backbone of the industries of this country. To it everything that had been done was due, and on it, they believed, the future of trade and commerce depended.

Lord Avebury, who seconded, pointed out that the reasons against municipal trading might be put under five heads: (1) The legitimate functions of municipalities were already enough, if not too much, to tax all their energies. The problems with which they had to deal were of the greatest importance, and many of them difficult. (2) It involved an enormous addition to municipal debt. (3) It created a tendency to involve municipalities in labour disputes. (4) Owing to there not being the same stimulus to economy, one of two things would in all probability happen—either there would be a loss on the undertaking or the service would cost more. (5) It was a serious check to progress and discovery. With regard to the first point, it was not necessary to say much. If a man gave the whole of his time (say) to the London County Council, it would be impossible for him to get through the work, which thus fell more and more into the hands of the officials—of whom, of course, he only desired to speak in the highest terms. Apart from the duties properly devolving upon local governing bodies, the advocates of the policy of municipal trading would extend it to all sorts of enterprises; and if they once went as far as many of them wished to go, it would be very difficult to see where to draw the line. Public control was one thing; and public management was quite a different one. They were all in favour of the former; but it was a great thing to have the management and the control kept separate. In regard to the second head, he might mention that in 1893-4 the municipal debt was £193,000,000; whereas by 1903-4 it had risen to £469,000,000—an increase of £276,000,000 in ten years. The third point was equally obvious. Many of them had looked with great apprehension on the increase in the number of municipal employees. Autocracy was only another name for bureaucracy. The idea of their friends seemed to be that London, for instance, should consist of a certain number of county councillors, a few aldermen, and 4,800,000 employees. This apparently was to what their theories would lead. As to the fourth item, of course when municipalities had monopolies, it was very easy to make a profit on paper. All they had to do was to take what they chose out of the pockets of the ratepayers and call it profit. But he doubted if a profit had ever been made except with a monopoly. Those of them who were engaged in practical business knew that the profits depended upon close attention to details, on watching the turn of the market, and on giving mind and thought to the business. This was quite impossible for the members of a municipality, who had so many other things to attend to; and consequently municipal management could not be so profitable or successful as private management. Out of 48 municipalities working tramways, only 13 made any contribution to the rates; while from twelve months' operations of 191 electric light undertakings (having a capital of £27,000,000), the profit claimed was £341,000. The sum set aside for depreciation, however, only amounted to something like 1 per cent.; and if 2½ per cent. had been allowed—which was really quite a minimum figure—it would have absorbed about £673,000, and would have turned the so-called profit into a heavy loss. As to the fifth point, all economists had strongly urged that interference with trade by states or municipalities was economically a fatal mistake. After referring at some length to the London tramways in illustration of his arguments, Lord Avebury said that Parliament should insist on a really thorough and independent audit of the accounts of municipalities as regarded all trading undertakings. It was not that the accounts were made intentionally wrong; but so much depended on the proper allowances for depreciation and the distribution of the general charges. One of the causes of the present state of things was compounding. Thousands of voters paid no direct rates, and so did not realize that they had any interest in economy, though in reality they had. The municipal trading tendency would certainly make life more expensive to them, as well as to everybody else.

Then the largest ratepayers had no vote. There had been devised a system by which one set of people paid the money and another set spent it; and he thought this would never conduce to economy. It seemed to him to be perfectly clear that governments and municipalities could not work so economically as private enterprise; and it followed therefore that municipal trading would not only increase the rates more and more, but would also raise the price of necessities. Thus on the one hand it cut down the incomes of the community, and on the other it made life more expensive.

The report was adopted; and Mr. Walter Morrison thereafter proposed the election of Sir Felix Schuster as President and Lord Avebury as Vice-President of the League, and the re-appointment of the Council. As to the enormous growth of local indebtedness, he remarked that while £8,000,000 a year was being paid off the National Debt, four or five times as much was added to the total of municipal advances. This must be checked. It was, he thought, desirable that the limit for the repayment of loans should be fixed at twenty years; as it was only fair that the generation who spent the money should pay it. After referring to the question of voting, he concluded by expressing the opinion that municipalization was the very worst form of corruption, because it was not based on the money coming out of the corrupter's own pockets, but out of those of his neighbour. The proposal, having been seconded by Mr. C. T. D. Crews, was agreed to.

Mr. J. F. Mason, M.P., next moved—"That it is of great importance, in the interests of economical administration, that every tenant whose rates are compounded for by his landlord should be informed of the amount included for such rates in his rent." He remarked that the rates in all the big towns—and especially in London—had grown to a most inordinate degree; and unless some change came over the electorate, it was quite possible that this increase would continue until it was stopped by the simple inability of the municipalities to borrow more money. Several evils resulted from this rapid rise in the rates. Besides the burden to the ratepayer, there was the reduced taxable capacity of the people. They could not pay in every way; and if they were highly rated, they were incapable of being highly taxed. Then, as the rates rose, each shilling addition would produce less than the previous shilling did; for very high rates must prejudicially affect the value of property. Next there was the emigration of industries from highly-rated districts. Thus when the rates reached a certain point, an increase might produce no more than the lower rate formerly did. It was quite possible that the effect of (say) a 20s. rate on the property in a district might be such that the total result would not be so much as would be realized by (say) a 15s. rate. This point once arrived at, security would be at an end, and borrowing would be impossible. Nearly half the people who were assessable in the whole of London were "compound" householders—that is, they were unaware that they paid rates at all, and consequently took no interest in municipal affairs. Thus they ascribed the increase in their rents to the greed of the landlords, instead of to the rise in the rates. He believed the only remedy for this state of things would be to show these voters that they were really ratepayers; and something to this end might be done without legislation. Landlords should be persuaded to divide the amount paid for rent and that paid for rates in their application notes and receipt forms.

The resolution was seconded by Mr. Featherstone Witty, the Chairman of the Bristol Ratepayers' Association, who gave some particulars regarding two municipal trading enterprises in his city—the electricity concern and the docks; and the motion was then carried.

Mr. C. J. Cater Scott, of the London and India Docks Company, next moved—"That, as parliamentary and joint-stock companies and other bodies contribute largely to Imperial and local taxation without possessing any vote in regard to Imperial and local expenditure, it is urgently necessary that there should be a reform of the franchise, so that taxation may be accompanied as far as possible by representation." He suggested to the Council that possibly later in the year a deputation might be arranged to wait on the Local Government Board, and see whether they could not get some support from them.

This resolution was seconded by Lord Claud Hamilton, and unanimously agreed to.

This concluded the business on the *agenda;* and the meeting separated after passing a hearty vote of thanks to Sir Felix Schuster for occupying the chair.

The death took place rather suddenly at East Grinstead last Friday of Mr. Claude Baggallay, K.C., who was well known to many of our readers as a prominent member of the Parliamentary Bar. Deceased was the fourth son of the late Lord Justice Baggallay, and brother of Mr. Ernest Baggallay, the Metropolitan Police Magistrate. He was born on Oct. 26, 1853, and was educated at Trinity Hall, Cambridge. He was called to the Bar at Lincoln's Inn in 1878, and went the Midland Circuit. He took "silk" in 1897, and was elected a Bencher of his Inn two years ago. Both as a junior and as a leader, he enjoyed a considerable practice, being briefed in most important gas and water cases. His health began to fail about a year ago; and he had recently undergone an operation.

DUBLIN CORPORATION AND THEIR AUDITOR.

BRIEF reference to the difficulty which has arisen between the Dublin Corporation and the Local Government Board Auditor was made in the "JOURNAL" some weeks ago. It was stated then that the Corporation refused to allow Mr. J. W. Drury, the Auditor in question, access to their books and accounts so as to allow him to carry out his official duties, and that in consequence he had been compelled to go to the High Court for a *mandamus* requiring the Town Clerk to produce the documents. The matter has since then considerably developed; and the Corporation certainly have been getting all the excitement which we ventured to remark they would probably derive from the dispute. The head and front of Mr. Drur'ys offence was evidently his candid criticism in the past of the Corporation's methods; and the Council endeavoured in vain to induce the Local Government Board to send another Auditor in his stead. It will be remembered that in the first place the parties to the action were Mr. Drury and the Town Clerk; but the Lord Chief Baron expressed a desire to have the Board and the Corporation also before him. To make a long story short, after several days' hearing, the Court of three Judges unanimously decided that the Corporation case had wholly failed. An order for a peremptory *mandamus* was therefore made, with directions that it should be served on all the present members of the Corporation and the Town Clerk; but a stay of a week was granted to permit of the serving of notice of appeal.

The Lord Chief Baron, who delivered the judgment of the Court, said the Auditor was charged with a statutory duty to audit the accounts, and this duty could not be performed without the production of the books and the vouchers. The Corporation case was that there was no duty imposed upon them; that there had been no sufficient demand upon, and refusal by, them to perform that duty; that the Auditor on former audits, and in reports made upon them, wilfully and corruptly exceeded his duty, with the object and effect of injuring the credit of the Corporation; that he intended to persist in the same course at the present audit, and therefore his object in applying for the writ was wholly, or at least in part, illegal, and to effect that illegality the Court would not assist him; and, further, that the remedy (if any) against the Corporation was by indictment and not by *mandamus*. The Court were of opinion that a duty to produce the books was imposed upon the Corporation; and the application to the Town Clerk (the proper officer) to produce the books, was a demand upon, and refusal by, them. As to the allegations against the Auditor, the Lord Chief Baron said "the duty of the Auditor was a public duty; and even were there misconduct by the Auditor in the performance of his duty in the past, it was impossible to rely on that misconduct as being an answer to the non-performance by the Corporation of a duty the performance of which was a condition precedent to affording to the ratepayers of the City of Dublin the information which it was their right to receive. If there was misconduct, the law had provided a mode by which it could be punished and prevented in the future; but this mode was not by adding to the wrong, which in that case would have been committing a further wrong of leaving unperformed a public duty. The past conduct of the officer was irrelevant to the present inquiry. . . . There was clear jurisdiction in the Auditor to enter on the audit. The well-settled principle, therefore, in proceedings in prohibition was here applicable—that where there was jurisdiction to enter upon the inquiry, the writ could not be applied for until the point was arrived at at which the illegality commenced. Even had there been in the past an overstepping of the bounds of jurisdiction, they could not presume that it would be repeated in the future." He then entered on a very lengthy consideration of the conduct of the Auditor, "solely in justice to that officer." "An auditor," he said, "under the Local Government Act, had to report upon the accounts; and the main object of his report was the information of the ratepayers. It was to be accompanied by abstracts only of those accounts. It seemed clear then that his report might—and in many cases ought to—show figures which the gross amounts brought into those abstracts, and the inquiries by which those figures were arrived at, together with such explanations as would bring home to the mind of the reader the true financial condition of the municipality, and the effect of the dealings which those figures represented." His Lordship then dealt very fully with Mr. Drury's reports, and said that in every case he had acted entirely within his jurisdiction; and he expressed his astonishment that the Corporation of such a city as Dublin should have thought themselves justified in passing a resolution directing that the books should not be produced to the Auditor. As to what had been termed "lecturing" by the Auditor, he said it occurred in cases where there had been illegality in fact, or a danger of loss through an irregular or faulty system. Where there was illegality, extravagance, loss, negligence, or improper conduct, or moneys withheld, the proper legal action for the Auditor to take was to surcharge [which it seems that Mr. Drury did on several occasions], whether the surcharge was accompanied by a lecture or not. There is no ambiguity about this judgment.

The crass obstinacy of the Dublin Corporation having thus brought them to this pass, a special meeting was summoned to consider the situation. The valiant speeches made on previous occasions when the matter had been discussed, no doubt made

retreat difficult; but the course of continued defiance on which the Corporation have now decided, can only render the final capitulation by them an even more painful operation than would otherwise have been the case. After what is termed a "heated debate," the Council resolved, by 35 votes to 12, to still refuse to give Mr. Drury access to the books; this being chosen in preference to either of the other two courses of appealing or yielding. The prospect of the eighty members of the Corporation, and the officials concerned, being taken off to prison, was lightly touched upon; but for the sake of the dignity of the city, it is to be hoped it may not become an accomplished fact. The Dublin Corporation, however, have evidently their own ideas of what constitutes dignity. Meantime, there has been some development of the case, to consider which another special meeting of the Council was called for yesterday. The members were then to be asked to reconsider their previous decision not to appeal against the judgment of the Lord Chief Baron. The grounds for this change were said to be the discovery (after the delivery of the judgment) "that the appointment of Mr. Drury as Auditor of the accounts of the Dublin Corporation was utterly illegal; that the Local Government Board entirely misconceived their statutory duties in the matter; and that, as a matter of fact, another and wholly different person ought to have been appointed Auditor." It was stated that the Act on which the Lord Chief Baron based his judgment provided that the Corporation accounts should be audited by the Auditor of the accounts of the North Dublin Union. That Auditor is a Mr. King; and upon the discovery being made, the Corporation promptly served notice upon him to come and audit their accounts. The Corporation loudly proclaim that their obstinacy has not been dictated by any desire to "conceal something;" and it is well if this really is the case, for their action has certainly succeeded in drawing public attention to the city finances more than even Mr. Drury's most trenchant criticisms could ever have done.

SALARIES AT WIGAN.

The Wigan County Borough Council—or it would be more correct to say certain members of this body—have several times provided "food for reflection" by their strange strivings after economy. On two or three occasions during recent years strenuous objections have been raised to the custom of authorizing the officials to attend Association meetings; and only last month attention was drawn in the "Journal" to an amusing debate which took place over the Gas Committee's resolution that their Engineer should represent the Corporation at the recent annual meeting of the Institution of Gas Engineers. While, however, referring back to the unconvincing arguments made use of at Wigan on this occasion, it is perhaps only fair to point out that (as was recorded last week) the objecting councillors have a friend in the Oldham Town Council, who, while not in opposition to the principle of sending the Manager to the Gas Institution meeting, thinks that the expenditure of such a sum as £8 4s. 6d. for the purpose is "a scandalous waste of the ratepayers' money." Thus in the small benefit to the town that some of the members of the Wigan Borough Council evidently think likely to result from authorizing their officials to attend technical meetings, they do not stand utterly alone; but with regard to their latest proposal, all farseeing people will fervently hope that they may long be left to enjoy a position of "splendid isolation." At any rate, councillors in other towns will certainly be ill-advised to follow their example—even should the result be no more serious than the raising of a laugh against themselves.

One is strongly tempted to regard the efforts of the Wigan economists in a humorous light; but we will endeavour to resist the inclination, and do our best to take these gentlemen—as it is to be presumed they take themselves—seriously, though it is a little difficult to determine whether the kinder course would not be to treat the whole matter as a joke. Briefly stated, the fact is that, having sought unsuccessfully to prevent the officials from adding to their knowledge (and therefore usefulness) by attending meetings of men occupying similar positions to themselves, a section of the Wigan Borough Council have equally unsuccessfully endeavoured to cut down their salaries. At the last monthly meeting, a resolution was proposed that, in view of the necessity for restricted expenditure, all Corporation officials who are in receipt of salaries of £300 per year, or over, shall have their salaries reduced by 25 per cent.—such reduction to take place as from Aug. 1, 1906." The mover himself openly acknowledged that he was leading a forlorn hope—so far he recognized the common sense possessed by the majority of his colleagues; but nevertheless a lengthy debate took place before the proposal received its *quietus*. The leader of the movement based his attitude on the fact that the Committees had, after they had made their estimates, been called together and asked as far as possible to reduce their expenditure for the coming year. As many of the humbler employees had been discharged, he thought the higher officials should be called upon to assist in lightening the burdens of the borough as much as they possibly could, "so that at the end of the financial year they might be able to lower the rates again, and then take into consideration that 25 per cent." It is true, no doubt, that the rates of Wigan, as elsewhere, "have gone up to an abnormal degree," and that it behoves the representatives of the ratepayers (and the ratepayers themselves) to see if something cannot be done to alter this depressing condition of affairs. But even apart from the injustice of the present proposition, its absurdity will be evident when it is pointed out that one member calculated that the effect on the rates, if the motion had been carried, would have been equal to ½d. in the pound. It is fair to assume that workmen have been discharged because they can be done without; but the same line of argument can hardly be applied to the higher officials. The present salaries, for a place of the importance of Wigan, by no means err on the side of extravagance; and, moreover, the officials cannot fairly be held responsible for the rising rates. Happily Wigan is not in danger of losing all its chief officers through this regrettable episode; for, as has already been remarked, the proposition met with but scanty support in the Council. To be exact, only eight voted for it and twenty-six against. Such incidents as this, however, if repeated, cannot fail in time to render it difficult for municipal bodies to induce the best men to enter their service. The truest economy is to secure thoroughly capable managers for the different departments—and, having secured them, to keep them; and it is safe to say that the surest means to this end is by increasing rather than diminishing the attractiveness of municipal employment.

A New Use for Tar Oils.

Writing in the current issue of the South Metropolitan Gas Company's "Co-Partnership Journal," "H. W. J." calls attention to one of the most recent applications of the heavy oils obtained from coal tar. It is a common experience in the spring that a short spell of warm weather will bring on plants, only to have their buds nipped by subsequent frost. It appears that a French gentleman, the owner of a large vineyard, has been endeavouring to protect his vines from such attacks in a rather curious way. He reasoned with himself that since cloudy weather is not conducive to the formation of frost, all that was needed was to make a cloud. He accordingly dug a number of holes in the paths of his plantation, and in each hole he placed resinous materials with pieces of pine and other vegetable refuse, set light to it, and so produced a dense smoky cloud which covered and protected his vines. His plan was so successful that he saved a quarter of his harvest, which meant about 150 barrels of wine. The applicability of this to the gas industry lies in the fact that the smokier the materials burnt, the heavier will be the cloud and the better the results; and as few things burn with greater smoke than coal tar and its products, the gentleman in question recommends the heavy oils obtained from the residues of gas manufacture as giving the best results he has obtained. If this discovery causes an increase in the price of heavy oil from its present low figure to 5s. per gallon, which is perhaps a considerably optimistic surmise, H. W. J. says their friends at Ordnance Wharf, and consequently their colleagues at the other stations of the Company, will be "rubbing their hands with great gusto."

The Tar-Works of the Paris Gas Company.

On the occasion of the recent Congress of the Société Technique, the members visited the tar-works of the Paris Gas Company at La Villette. As these works have not often been open for inspection, the privilege was much appreciated. They occupy an area of about 76,000 square yards, and deal annually with 60,000 metric tons of tar. The products are light and heavy oils, anthracene, and pitch; and some of them are sold to private parties, who extract their saleable constituents. The tar is conveyed into the works in barrels or in tank-waggons, and stored in elevated reservoirs, in which it gives up 3 or 4 per cent. of its moisture. It is afterwards distilled for 24 hours in direct-fired boilers of special construction. The water and light oils come off during the first 13 hours; and the heavy oils in the succeeding six hours. The following are the products in percentages: Water, 3; light oils, 2; heavy oils, 17; anthracene oil, 8; pitch, 70. The light oils, when rectified, furnish 90 per cent. benzol and benzene; and the heavy oils are sold crude for use in creosoting wood, heating, &c. From the anthracene oils is obtained crude anthracene, used in the production of colouring matters. Finally, the pitch is run hot into large vats, where it is left to cool slowly, after which it is sold, principally for making compressed fuel. This operation is carried on in an annexe to the works, where, with the aid of breeze, briquettes are made which are largely utilized by the Company.

Rear-Admiral John Bythesea, V.C., who was the Chairman of the Stroud Water-Works Company, left £65,853; and Mr. G. Saunders, one of the Directors of the Taunton Gas Company, £41,763.

Mr. John Lewis, the Inspector of Lighting to the Corporation of Glasgow, died at Fenwick, in Ayrshire, on Wednesday last, in his 49th year. He was a native of Glasgow, and had been connected with the Lighting Department for 28 years. He was appointed Assistant-Inspector in 1898, and Inspector in February, 1903, on the death of Mr. Hamilton. He had charge of the work of converting the street gas-lamps in the city from flat-flame to incandescent burners—a very heavy task, which he had all but completed when he was laid aside by illness about the beginning of June.

GERMAN ASSOCIATION OF GAS AND WATER ENGINEERS—REPORTS OF COMMISSIONS.

II.—The Electrolysis Commission.

During the past year, the Electrolysis Commission of the German Association of Gas and Water Engineers have been engaged in studying the electrical phenomena prevailing in six German towns where gas and water pipes lie near the rails of electrically propelled tramway systems. The towns referred to are: Freiburg, Erfurt, Stuttgart, Leipzig, Liegnitz, and Danzig. Further investigations are now in progress at Solingen, St. Gallen, and Frankfort-on-Maine; and when they are finished, it is proposed to examine the condition of gas and water mains in some other town (to be selected later on) where there is no electricity supply either for lighting or traction purposes. When the whole of this work has been brought to a conclusion, it is intended to publish an exhaustive report upon the subject of electrolysis, in order that the various lessons learnt may be set forth in such a manner as to admit of fuller comprehension than is perhaps possible at the present time.

In the meantime, however, the members of the Commission offer for consideration the results of their inquiries in the towns mentioned above. They lay special stress on the fact that all the work has been carried out under strictly parallel conditions; the measurements, indeed, having been made entirely by their Engineer (Herr Besig) in person. They also note that much more interest in the subject is being displayed in circles outside the parent Association than was formerly the case. When the circular letter of questions was first of all addressed to the German towns where electrical tram-lines exist, many authorities omitted to reply, or gave incorrect answers; but since that date, several local authorities have come to see the importance of the inquiry, and have asked that the phenomena in their towns should be investigated. Moreover, the German Association of Tram and Light Railway Proprietors, and the Association of Industrial Electricians have expressed a desire to be connected with the research; while the latter body asked that a report should be presented to their members at their last general meeting. The Electrolysis Commission are also gratified to observe the interest displayed in Great Britain, France, and the United States during the past year in the work they have been carrying out.

In the model code of regulations issued by the Commission last year, the opinion was expressed that if gas and water pipes are to be protected from corrosion induced by stray earth currents, the maximum difference in potential ("P.D.") between different spots in the tram rails, or between rails and pipes should not exceed a certain figure, but that the precise figure might be made dependent upon local conditions, such as the nature of the soil, &c. This opinion still appears justifiable; but the investigations carried out at Strassburg have rendered it desirable that the mechanism of corrosion should be further studied from an electrochemical standpoint. Dr. Bunte, Dr. Goldschmidt, and Professor Haber have kindly offered their assistance in this direction, and work has already been done by Herr Besig at Strassburg and Karlsruhe under their supervision. The results of the electrochemical tests at Strassburg have already been published in the "*Zeitschrift für Elektrochemie*;" while those at Karlsruhe are described at considerable length by Professor Haber himself in a separate report presented to the Association of Gas and Water Engineers [which we shall deal with later on.]

The essential points of the report presented by the Electrolysis Commission are contained in two tables, which give details of the conditions found to occur in the six towns already mentioned, and also at Strassburg, Dresden, and Hamburg, which were studied last year. The results may perhaps be most conveniently summarized by selecting four towns for notice; two being places where harm has already been done to the gas and water pipes, and the other two being places where no corrosion is occurring. The towns where conditions are satisfactory are Hamburg and Freiburg; those where serious injury has been done to the pipes are Strassburg and Erfurt. The electrical trams were brought into operation at Strassburg in 1896. The return conductors are insulated, but their resistances are not balanced. Their total length, and the weight of copper in them, are equal to the length and copper of the outward leads. The gas and water pipes have suffered considerably in certain districts, and in other places where the soil is unfavourable. The trams at Erfurt were started in 1893; being one of the oldest systems in Germany. The returns are now unbalanced insulated conductors, and they weigh altogether (so far as their copper is concerned) about 50 per cent. of the feeders. The pipes have suffered seriously in certain districts. In the early days, the return conductors must have been very faulty; but they were improved about five years ago, though there are still defects in their arrangement, and in some of the rail joints. No doubt most of the injury done to the pipes took place before the returns were improved; but failures are now cropping up in increasing numbers. Last January, the pressure in the water-pipes was raised by 4 atmospheres, when the pipes collapsed in ten places, all of which were situated in districts where the electrical measurements showed danger zones to exist. The soil at Erfurt favours electrolytic action. The trams at Hamburg were started in 1893 also. There are now 24 insulated return conductors, 7 of which have balanced resistances. The total length of the returns is about 80 per cent of that of the outward leads; and the weight of copper in them is 111 per cent. Since the date when insulated returns were adopted, no injury has been done to the gas or water pipes. The electrical trams at Freiburg were only opened in 1901. There are two insulated but unbalanced returns, equal in length to the outward conductors, and weighing about 81 per cent. of the latter in terms of copper. No harm has yet been done to the pipes at Freiburg.

Town.	Average Local P.D. Between Pipes and Rails.		Average P. D. per Kilometre of		Volume of Current Flowing in Pipes.		Mean P.D. Between Taking off Points.	Mean Total P.D. Between Different Parts of	
	Pipes Pos.	Pipes Neg.	Rails.	Pipes.	Max.	Mean.	—	Rails.	Pipes.
	Volts.	Volts.	Volts.	Volts.	Amp.	Amp.	Volts.	Volts.	Volts.
Strassburg .	2·2	4·0	3·3	0·3	1·0	0·7	4·0	8·0	1·5
Erfurt . .	3·5	1·2	3·3	0·9	6·8	4·0	4·1	7·0	2·0
Hamburg .	0·4	0·8	—	<0·1	—	<0·1	0·7	1·5	<0·5
Freiburg. .	1·0	0·6	1·3	0·4	—	<1·0	1·2	2·0	<1·0

The two taking-off points are unfavourably situated, as the table shows; for the P.D. between them is high, although of the same polarity. This defect could easily be remedied by inserting a variable resistance in the shorter return. The soil at Freiburg does not favour electrolytic attack of the pipes.

A few additional particulars may be given of the other towns not included in the table. At Stuttgart, the bare tram returns are not only laid alongside the bare middle conductor of the electric light service in the same troughs, but they are frequently connected together by soldered copper wires. This has the effect of increasing the metallic area of the returns; but it encourages the escape of the returning currents into the earth. It also leads to unusually high P.D.s. in the pipes, especially in the neighbourhood of the bare mains. The mean P.D. observed in the pipes per kilometre run was 14 volts, and the maximum 24 volts; the highest mean in any other town being 5 volts, and the highest maximum 9·2 volts (both at Liegnitz). The mean P.D. in the rails at Stuttgart per kilometre was only 1·6 volts, and the maximum 2·9 volts. The maximum and mean currents found flowing were only 1·2 and 0·8 ampères; but all the water stop-valves and the hydrants are fitted with flanged connections, which offer higher resistances than socket joints. The soil at Stuttgart does not favour electrolysis; and the ground water level is low. The plan of connecting the tram returns and the middle lighting conductor causes the water-pipes to be negative to the rails all over the the town except in the immediate proximity of the generating stations. Nevertheless, failures of the water-pipes occur constantly in different districts, especially near the bare returns. This shows once again that pipes are injured by electrical currents flowing in them even when the pipes are electro-negative in respect of the tram-rails. Current may escape from such relatively negative pipes in places where the earth is wet, or where some other pipe system is near at hand. At Stuttgart, two sets of water-pipes lie in nearly all the streets, and are only a few inches apart.

Leipzig is a city where attention has always been directed to the safe return of the tram currents, and where but little harm has been done to the pipes until recently. Now, however, lead pipes are beginning to fail. There are two Tram Companies which in places run over each other's rails. One Company have adopted balanced insulated returns, and their joints are generally well bonded; but the other employ unbalanced bare returns, and have many bad rail joints. Hence the precautions taken by the former are rendered illusory. The region where the pipes are positive towards the rails is unusually large at Leipzig; and this is presumably the reason why so little damage has been experienced hitherto. The large area of the "positive zone" means that the pipes are endangered over a large district; but it also means that electricity can escape from them at a low current density—electrolytic corrosion being therefore slower than it otherwise would be. A good deal of trouble has recently been met with in the armour of the lighting mains. Generally the insulation is at fault; some of the lighting current escaping to earth. It has also been found, however, that the armour was conveying return currents of appreciable magnitude from the tram service. Lead pipes have already suffered, and iron pipes are beginning to corrode at Liegnitz. In this town, the bare middle conductor of the lighting service is earthed in many places and connected with the tram-lines. A large number of motors and lamps are in use having their positive poles connected with the trolley wires and their negative poles with the rails. The negative wires frequently communicate with earth before joining the main return conductor, which is itself often earthed as a protection against lightning where it is carried overhead. Thus much current passes through the soil at Liegnitz.

A unique feature was met with at Danzig—viz., that the P.D.s between the rails and pipes showed sudden changes of polarity at various spots close together. This was the case in places where the tram-lines pass over swing bridges, and also elsewhere. At the bridges the rail ends were either not joined together at all,

or were connected under water by bare or badly insulated cables. Moreover, proper joints between the rails were found to be lacking in many places, and very inefficient in others. Fortunately the ground in most of the danger zone consists principally of dry sand; but the iron pipes are beginning to suffer. The return conductors at Danzig consist of a few short insulated cables not provided with variable resistances. The proprietors of the tramlines have shown much interest in the investigations carried out, and are now engaged in improving the joints on their system, and in making good the electrical connections between the interrupted lines at the swing bridges.

COMETS IN THE GAS INDUSTRY.

By An Observer.

No. 3.—The Intrinsic Value of Tar.

It will probably be news to many of your readers that the profits earned by tar distillers and chemical manufacturers out of coal tar are very much more then those earned by gas undertakings, and that the tar, after leaving the gas-works, brings in more grist to the mill than gas, coke, tar, and sulphate, taken altogether, contribute to the gas-works exchequers. A circular has recently been issued by an influential Committee, representative of both pure and applied chemistry in Great Britain, France, Germany, and Switzerland, in connection with the proposed Perkin Memorial Fund; and one of the statements in this circular is to the effect that the value of the coal-tar colour industry is some 20 millions sterling per annum. These gentlemen may be trusted to know what they are talking about; and the estimate may be taken as approximately correct. If the coal-tar colours only bring in this very respectable amount of profit, what is the total value of the whole tar industry, which includes many other valuable products, such as creosote, naphthalene, anthracene, pitch, &c.?

Referring to the latest available parliamentary return, which is that for the year 1903, one finds that the aggregate annual value of the statutory gas undertakings in the United Kingdom, as shown by the excess of receipts over expenditure, is about 7¼ millions sterling. The quantity of coal carbonized is 14¼ million tons approximately, which would represent about 700,000 tons of coal-tar. Before comparing these figures, there are several disturbing factors to be considered. While the gas-works statistics apply to the United Kingdom only, it is probable that those of the coal-tar colour industry include the whole of Europe. Coal-gas works cannot claim to be the only source of coal tar, as an appreciable quantity is produced by blast-furnaces and coke-ovens. On the other hand, the parliamentary return does not include the production at non-statutory gas-works, and a considerable quantity of tar is used for making asphalt and for other purposes.

In order to arrive at a rough comparison, we will assume that the value of the other products outsets the proportion of foreign tar included in the estimate, and that the tar contributed from sources other than coal-gas works, makes up for that disposed of in other ways. The tar made by non-statutory companies may be neglected, as in the villages and small towns there is usually sufficient local demand to use up all the make; so that a small proportion only finds its way to the chemical works. With these corrections, we arrive at the following figures:—

Total value of the coal-tar chemical industry . .	£20,000,000
,, ,, coal-gas ,, . .	£7,250,000
Total quantity of tar supplied to distillers . . .	700,000 tons.
Price received for same—say 16s. 8d. per ton . .	£584,000

It will be understood that the coal-tar chemical industry includes the distillation or other treatment of tar for the purpose of extracting dyes or other valuable products therefrom, and not the admixture of raw tar with other materials to form asphalt, roofing felt, &c., or that used in the crude state. The profit made by the distillers and chemical manufacturers is about three times that made by the gas undertakings, and over thirty times as much as the cost of the crude product.

By reference to the parliamentary return above mentioned, it will be seen that the gross receipts are rather under £2 per ton of coal carbonized, and the net profit about 10s. The average cost of the coal is something like 14s. per ton; so that the net profit is about 70 per cent. of the cost of the material. Yet gas companies do not complain of the heavy cost of their staple material. If the tar distillers bought tar in anything like a similar proportion, they would pay, not 16s. 8d., but something over £50 a ton for it. Their present enormous profits of some £30 to £40 per ton of tar are due, in no slight degree, to the fact that they get their staple material at a merely nominal price, far lower than that usual in manufacturing industries. The owners of metal ores, for instance, would scarcely be willing to part with their property at a price based upon 2½ or 3 per cent. of the total profits.

The unfair position occupied by gas undertakings in this matter acquires increased importance at the present juncture, when they are threatened by competition of various kinds, and are continually being reminded of the desirability of selling gas at the lowest possible cost. An important feature to this end is the securing at any rate of a fair share of the actual intrinsic value of the residuals. The profit earned from tar is sufficient to pay their coal bill twice over, and therefore the idea of the residuals paying for the coal and working expenses, leaving the gas to form the profit, is not so much of a chimera or an absurdity as many would suppose. Even after making every possible deduction from the above estimates, it is evident that the distillers and chemical manufacturers can well afford to pay much higher prices for tar than those at present obtaining, and if they are not willing to meet the position in a reasonable way, gas undertakings will do well to take Sir George Livesey's advice seriously, and see what can be done in the way of lifting some considerable proportion of the total production of tar into other channels. In this connection it may be remarked that the total surplus of tar available for the distillers is not a comparatively large quantity. A great deal has been said about over-production; and, of course, as the make of gas increases year by year more tar is made. But the quantity is less than 1 cwt. per ton of coal carbonized; and it is not such a very serious matter to be independent of the distiller to a very much greater extent than at present. This astute individual has been able to take advantage not so much of over-production as of steady constant production, and the fact that gas undertakings as a rule have allowed him to fix his own price. There is no reason why they should permit this state of affairs to continue. No doubt there is something to be done in the commercial exploitation of residuals all round; but by far the first and most important is this question of the intrinsic value of tar.

(To be continued.)

SOCIETY OF CHEMICAL INDUSTRY.

Annual Meeting in Manchester.

The Annual General Meeting of the Society of Chemical Industry commenced in Manchester last Wednesday; the business being transacted in the hall of the Municipal School of Technology. The President (Dr. Edward Divers) occupied the chair, and was supported by the President-elect (Mr. Eustace Carey), and other gentlemen. There was a fair attendance.

Before the formal proceedings began, Dr. Hewitt, on behalf of the Manchester Section of the Society, welcomed the members; and a similar welcome was extended to them by the Lord Mayor (Mr. J. Herbert Thewlis). The report of the Council, which was taken as read, showed that the number of members on the register is now 4429, compared with 4326 this time last year. In the course of the twelve months, 356 members were elected, against 452 before; the losses were 253, against 260; and there were 33 deaths, compared with 41. It has been decided to petition His Majesty the King to grant the Society a Royal Charter of Incorporation. The medal of the Society has been awarded to Dr. Ludwig Mond, F.R.S., for his conspicuous services to applied chemistry in all the three departments for which the medal was established—viz., research, discovery, and improvements in processes. The report having been adopted, the President delivered his Inaugural Address. It consisted of a retrospect of the life of the Society, which was incorporated in 1881 at the rooms of the Chemical Society in Burlington House. He reviewed the work done, traced the development of the various sections, laid stress on the value of the Society's "Journal," and emphasized the necessity for the early dissemination of knowledge relating to the application of chemistry. On the motion of Mr. Henry Roscoe, seconded by Mr. Carey, a vote of thanks was accorded to the President for his address. By invitation of Professor Percy F. Frankland, it was decided to hold next year's meeting in Birmingham.

At the close of the business, the afternoon was spent in visiting works; and in the evening the Lord Mayor held a reception at the Town Hall. On Thursday other works and places of interest—including the Ship Canal Docks and the Corporation Electricity Station—were inspected; and in the evening the annual dinner took place in the Grand Hotel. Friday was devoted to an excursion to Hope, Castleton, and Hathersage; and the meeting ended with a *conversazione* at the Manchester University and a reception by the Vice-Chancellor.

The Long-Distance Transmission of Gas.—In the "Journal" last week (p. 100), we gave a translation of the report of the Photometry Commission of the German Association of Gas and Water Engineers, in the first portion of which the effect of the long-distance transmission of gas upon its illuminating power and calorific value is discussed. During the tests described in the report, it was found that if the volume of the gas arriving at the far end of the transmission system was recalculated to that corresponding with its initial pressure, the volume so obtained was smaller than that given by Dr. Pole's formula; and it was pointed out that more correct results are furnished by the formula quoted in the "Journal für Gasbeleuchtung" for 1904 (p. 898), which gives the correct gas volumes as calculated for the initial pressure, as long as the co-efficient of friction remains unaltered. Having had inquiries respecting the formula referred to, we may say that it was contained in a contribution by Dr. Velde, of Görlitz, of which an abstract translation, with elucidatory notes, appeared in the "Journal" for Nov. 1, 1904 (p. 330).

REPORT ON THE KRAMERS AND AARTS WATER-GAS PLANT AT ZEVENBERGEN GAS-WORKS.

Before Dr. A. Steger read his paper, on the Kramers and Aarts water-gas system, at the annual meeting of the Société Technique du Gaz, the Secretary of the Society (M. Payet) very briefly referred to his report on tests which he, in conjunction with others, had made upon the plant installed at the Zevenbergen Gas-Works. From this report, we take the following particulars.

The trials originated in the submission by the firm of MM. J. & O. G. Pierson (who are the representatives in France of the Kramers and Aarts system) of a producer on this system in one of the annual competitions of the Société Technique. The tests

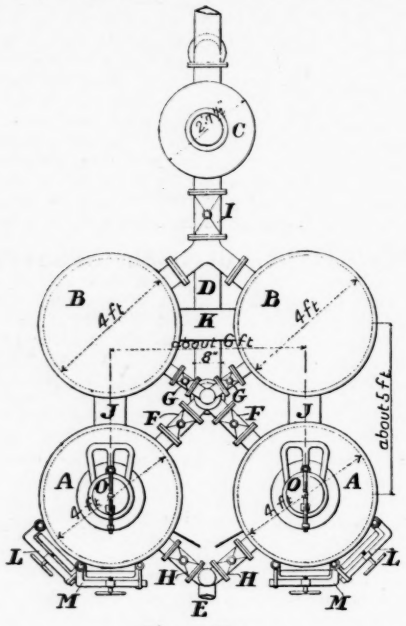


Fig. 1.—Plan.

took place on May 2, 3, and 4 of this year. There were present Dr. Steger, the Manager of the Kramers and Aarts Company, M. Hartman, their Chemist, M. Pierson, of Paris, and M. Payet, delegated by the Société Technique du Gaz. Zevenbergen is a little place on the borders of Holland and Belgium. Its gas-works have two sets of water-gas plant, upon one of which the tests were carried out; its nominal capacity being 50 cubic metres (1766 cubic feet) per hour.

The plant was started in May, 1904; and it only works during the day. The water-gas made is sent along into the coal-gas retorts; means being provided for the self-enrichment of the gas in normal working. From a note at the end of the report, we learn that the leading of the water gas to the bottom of the retort is effected by a wrought-iron tube 75 mm. (3 inches) diameter. It is controlled by a tap which can be manipulated from the front of the bench. About 10 cubic metres (350 cubic feet) of water gas are mixed with each charge. It is put in a quarter-of-an-hour after the beginning of the charge, and lasts for three-quarters of an hour. The charges are made every four hours; each being of the weight of 130 kilos. (287 lbs.), or a little over 2½ cwt. The retorts are oval in shape, 520 mm. by 380 mm. (20½ inches by 15 inches), and 2·80 metres, or about 9 ft. 2 in., long.

The accompanying illustrations, with the descriptive lines at foot, will clearly show the arrangement of the apparatus. Fig. 1

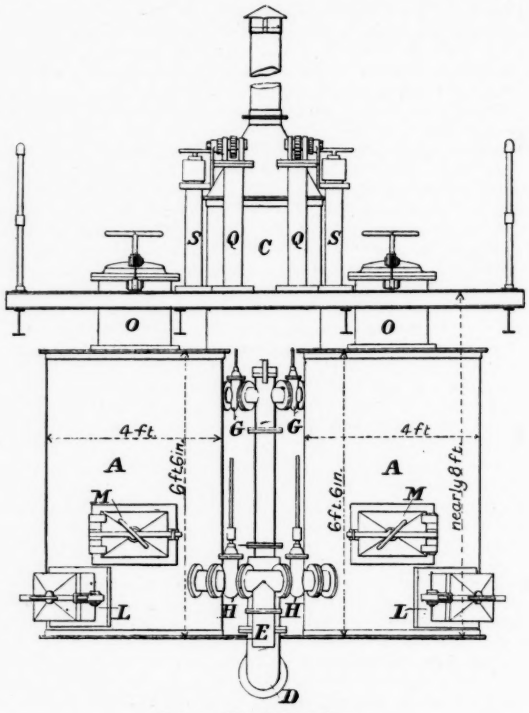


Fig. 2.—Front Elevation.

A.—Generator, about 4 ft. dia., 6 ft. 6 in. high. B.—Regenerator, about 4 ft. dia., 6 ft. 6 in. high. C.—Superheater, about 2 ft. 7½ in. dia., 11 ft. high. D.—Air pipe, about 8 in. dia. E.—Gas pipe, about 4 in. dia. F.—Primary air valve. G.—Secondary air valve. H.—Gas valve. I.—Superheater valve. J.—Connection between generator and regenerator. K.—Connection between regenerator and regenerator. L.—Ash-pit door, 10 in. by 16 in. M.—Clinkering door, 10 in. by 16 in. N.—Sight hole. O.—Charging hopper. P.—Gear for working air-valves. Q.—Gear for working gas-valve. R.—Gear for working superheater valve. S.—Gear for working steam-cock.

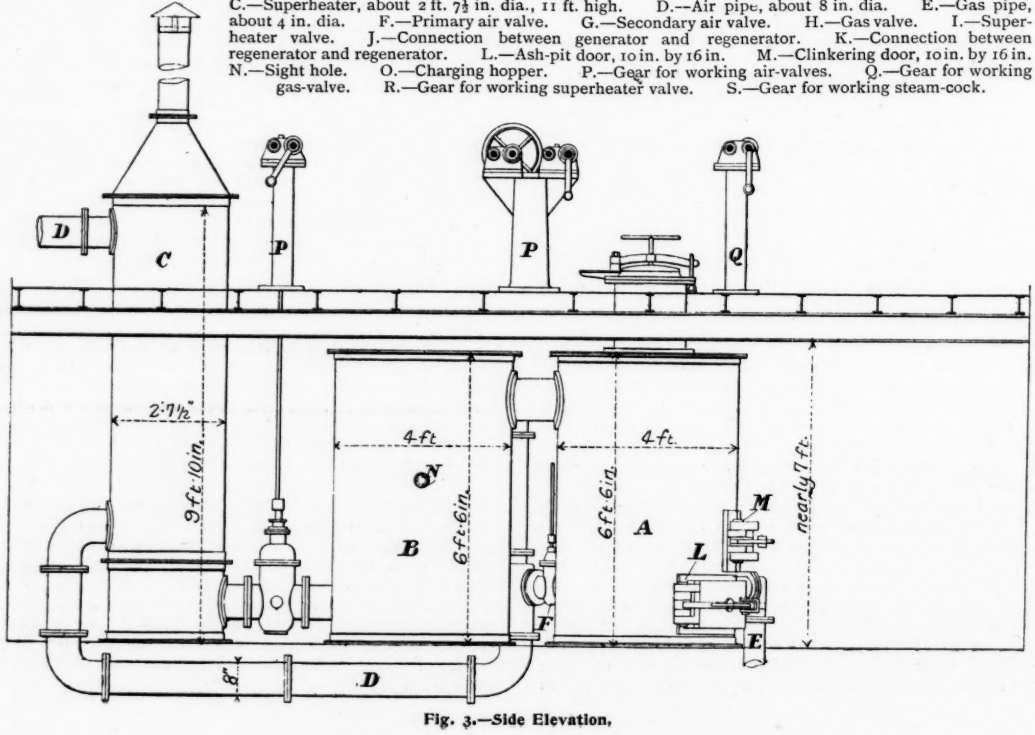


Fig. 3.—Side Elevation.

gives a view in plan; fig. 2, a front elevation looking at the generators; and fig. 3, a side elevation showing the three divisions of the plant—generator, regenerator, and superheater. There are two exactly similar generators, which work alternatively—one as a generator proper, and the other as a "reducer." The two regenerators are also exactly alike and contain settings of bricks. The generators are 2 metres (6 ft. 6¾ in.) high and 1·210 m. (about 4 feet) in diameter. At the lower part are horizontal fire-bars; above them is a rectangular clinkering door, 10 inches by 16 inches; and below, another door of the same size giving access to the ash-pit. Then below the fire-bars is the end of the gas outlet-pipe, and the primary air blow-pipe meets the steam-blast; each being controlled by a valve. At the upper part of each generator is the pipe which connects it to the regenerator. These regenerators are of the same size as the generators. At their top, they connect with the generator and receive the incoming secondary air, which is controlled by a valve. At their bottom, they are joined together by a pipe, and there are the gas-outlets, which run into one pipe on which is fixed a valve. An oval hole allows of cleaning out; and the inside temperature can be judged from a sight-hole placed halfway up. The superheater is 800 mm. (about 2 ft. 7½ in.) in diameter and 3 m. (9 ft. 10 in.) high. Through it, from top to bottom, runs the air blow-pipe. At the lower end, it communicates with the gas-outlet; and at the upper part, it finishes with a chimney, which takes off the gases coming from the "blow." The pipes which carry the primary air of the "blow" into the bottom of the generator, and the secondary air into the top of the regenerators, are horizontal, and run into a vertical main closed at its upper end by a safety valve. Between the primary and secondary air pipes is a small automatic blow-off, which is open during the "run" and shut during the "blow." Its object is to clear out the combustible gases that might accumulate in the air-main, if the controlling valves were not tight. A very simple and automatic throwing-in gear prevents any wrong manipulation, and especially any unexpected air during the time of manufacture.

Accessory apparatus at the Zevenbergen Gas-Works consists of: A vertical boiler of 5 atmospheres' pressure and 3 square metres (32·29 square feet) heating surface; a scrubber; a gas-holder of 50 cubic metres (1766 cubic feet) capacity, which receives the gas immediately after leaving the scrubber; a meter of 100 cubic metres (3532 cubic feet) per hour, through which the gas passes before being distributed for self-enrichment; and, lastly, a blower driven by a 7-horse power Crossley gas-engine, which is also used for working the pumps and exhauster.

The operations for gas making are as follows: (1) A "blow" of 40 seconds with air; (2) a "blow" of 5 seconds with steam, in order to sweep away the last traces of air (for these two "blows," the two generators and the two regenerators work in parallel into the superheater and exhaust chimney); (3) a "run" with steam lasting about 5 minutes. During this operation the two generators and regenerators all work one after the other.

According to the inventors' theory, the formation of gas during the "run" is the result of the following successive operations: (1) The passing of steam through the first generator produces a mixture of CO_2, of CO, and of undecomposed steam; (2) this mixture becomes wholly transformed in the regenerators into H and CO_2, in consequence of the splitting-up of the steam and the combustion of CO; (3) lastly, during the passing of the gas through the second generator, the CO_2 is definitely reduced, so that the final gas mixture is almost entirely composed of hydrogen and carbonic oxide. The two generators work alternatively as actual generators and as a "reducer."

The tests included an inspection of the apparatus, a starting in action, a test of consumption, the measuring of the air used during a "blow," and, lastly, laboratory experiments. These were carried out both on pure water gas and on mixed gas following upon self-enrichment. They were done in the well-equipped gas-works' laboratory, and consisted in ascertaining the calorific power of the gas by means of a Junkers calorimeter; analyzing the gas made; and measuring the lighting power of the mixed gas only. From the moment of first starting a fire on the fire bars (using quenched coke) until the time that good gas was being made, was a period of 1 hour 40 min. Gas mixed with 20 per cent. of water gas gave averages of calorific power of 5687 and 5658 calories at standard temperature and barometric pressure. Analyses of the gas gave the following percentage results:—

Carbonic acid (CO_2)	0·3	..	0·3	..	0·3
Oxygen (O)	0·2	..	0·2	..	0·2
Ethylene (C_2H_4)	3·5	..	3·5	..	3·5
Carbonic oxide (CO)	13·2	..	13·2	..	13·2
Marsh gas (CH_4)	28·9	..	24·8	..	22·0
Hydrogen (H)	46·3	..	55·4	..	57·9
Nitrogen (N)	7·6	..	2·6	..	2·9

Messrs. Pierson suggested that it would be useful to make a prolonged test of consumption, so that drawbacks due to the necessities of manufacture, as well as to those arising from the formation of cinders and clinker, might be included with certainty in the results obtained. This would undoubtedly have led to less favourable results than those of a few hours' test, and would give a more exact idea of the value of the apparatus. But, besides the question of supervision, it is to be remembered that many water-gas plants, and in particular that at Zevenbergen, are necessarily intended to work intermittently. So in agreement with Messrs. Pierson and Dr. Steger, we had a trial extending to 10 hours only, commencing at any moment in normal working. There is also the question of taking into account the clinker and ash produced. But we decided that, to be practical, such amount could only be exactly ascertained after knowing the quantity of fuel used during the test, and after the proportion of ash in the fuel had been found out by analysis. So, as many other plants have had their figures of consumption stated without calculating the residue, we thought that it would not be fair to treat the apparatus at Zevenbergen in any different way; and we therefore give the results obtained by us under the same conditions. The number of runs was 96. A small gasholder of 5 cubic metres capacity (176 cubic feet) was connected during the tests with the water-gas holder, so that it continuously received a small proportion of the make, which might be regarded as an average sample of the total gas made. It was upon this gas that the laboratory tests were made. The following are the results that were obtained.

(1.) *Coke Used.*—The generators were filled at the beginning and at the end of the tests. The quantity of coke used in the interval was found to be 186·5 kilos. (411·162 lbs.). This relates to the fuel gasified—not counting the clinker and ash.

(2.) *Gas Made.*—This amounted to 463 cubic metres, or 16,351 cubic feet. This corresponds to 2·485 cubic metres (87·7617 cubic feet) per kilogramme (2·2046 lbs.) of coke used—not reckoning clinker and ash, or 39·808 cubic feet of gas per pound of coke. In a note to the paper, a calculation is made so as to arrive at the net yield of gas, making allowance for the residual clinker. The corrected figure is 2·440 cubic metres (86·1725 cubic feet) per kilo. of coke, which corresponds to 39·087 cubic feet per pound of coke used.

(3.) *Water Used.*—The water vaporized was found by deducting the water left at the end of the test from that at the beginning; the levels being referred to the same mark. The amount proved to be 300·592 litres—say, 300·6 litres (66·16 gallons). This corresponds to 1·611 kilos. (3·7698 lbs.) per kilo. of coke used (say, 1·709 lbs. of water vaporized per pound of coke), not counting clinker and ash; or 64·92 kilos. (143·124 lbs.) per cubic metre (35·3166 cubic feet) of gas made—say, 4·052 lbs. of steam per cubic foot of gas. The figure of 1·611 kilos. per kilo. of coke is corrected, in the note previously referred to, to 1·584 kilo. (3·492 lbs.) per kilo. of coke gasified—say, 1·584 lbs. of water vaporized per pound of coke gasified.

(4.) *Speed of Air-Blast.*—This was measured by an anemometer placed on the centre-line of the blow-pipe 210 mm. in diameter (about 8 inches). The speed was found to be equal to 8·83 metres, or very nearly 29 feet, per second.

(5.) *Laboratory Tests.*—The average of ten tests on the calorific power of the gas at 15° C. and 761 mm. was found to be equal to 2772 calories, water condensed. [An appendix to the report gives details of 23 tests with the Junkers calorimeter—12 on gas mixed with 20 per cent. of water gas—the average heating power being 5566 calories.] Of condensed water, 55·970 grammes were collected for 150 litres (5·297 cubic feet) of gas burnt. This corresponds to 373 grammes per cubic metre, and to an amount of hydrogen of about 46·27 per cent. Analyses of the gas gave the following percentage results:—

Carbonic acid (CO_2)	3·4	..	3·4	..	3·8
Oxygen (O)	0·1	..	0	..	0
Carbonic oxide (CO)	43·0	..	42·9	..	42·7
Hydrogen (H)	46·7	..	48·8	..	49·3
Nitrogen (N)	6·8	..	4·9	..	4·2

(6.) *Clinkering.*—This could only be done about two hours after the 10 hours' test was over, owing to the plant having to be continued in action for the needs of the works. It was effected with great ease by a stoker and his assistant. It took less than 15 minutes for one of the generators, and a little more than 10 minutes for the other. Both generators had been in work for nearly 14 hours. The small quantity of clinker was undoubtedly due to the slight amount of ash in the coke used; but the absence of any sticking of the clinker to the sides, and the facility with which it was removed, should be noted none the less.

(7.) *Analysis of the Coke Used.*—A series of analyses on an average sample of the coke used gave results which are recorded in the report, the average of which is: Moisture, 2·23 per cent. The amount of dry matter was: Volatile matter, 1·16 per cent.; fixed carbon, 92·06 per cent.; ash, 6·78 per cent. The coke, which had very little ash, was made from Westphalian coal, which had been in store for about three months.

Lastly, the report says that the excellent photometrical results that were obtained were owing to the exceptional quality of the coal used.

The Lord Chancellor has added the name of Mr. Lawrence Clayton, of Messrs. Clayton, Son, and Co., Limited, of Hunslet, to the Commission of the Peace for the City of Leeds.

We have received from George Newnes, Limited, Part XIII. of the "Technological and Scientific Dictionary" which has for some time been in course of publication by them, under the editorship of Mr. G. F. Goodchild, B.A., and C. F. Tweney. It extends from "tic" to "warehouse." It was originally intended to complete the work with the part now under notice; but the publishers found they could not do this without excluding information resulting from recent research, and therefore they decided to extend it by one part. When complete, it will be a handy book of reference.

DEVONPORT CORPORATION GAS-WORKS.

Inauguration of the Carburetted Water-Gas Plant.

About a hundred gentlemen accepted an invitation to visit the Devonport Corporation Gas-Works last Wednesday, to witness the formal inauguration of the carburetted water-gas plant, the installation of which marks the close of a somewhat remarkable controversy. So far as the actual working of the plant is concerned, the ceremony was rather the consummation of a successful experiment than the beginning of a new process. The erection of the plant was completed some time ago; and it was stated in the course of the proceedings that for three or four months Devonport has been consuming a proportion of water gas without discovering the difference between the mixture and the former supply of coal gas. This may be taken as one guarantee of the success of the new plant; while another was to be found in the tributes to its successful working.

The installation, which was designed and constructed by Messrs. Saml. Cutler and Son, of Millwall, comprises two sets of generating plant, each capable of producing nominally 400,000 cubic feet of gas per diem. It is accommodated (including the washers and scrubbers) in a spacious steel building; the condenser only being in the open. The fuel for the generators is raised by a bucket elevator on to a plate conveyor, which supplies the steel overhead storage hopper, from which the coke is withdrawn into a special charging barrow of the correct charging capacity. The storage hopper holds 30 tons of coke, sufficient for the manufacture of about 1,600,000 cubic feet of gas, and hence it is only necessary to elevate the coke during the day time.

The plant is fitted with Cutler's patent interlocking gear for the control of the steam and air valves. Each section of apparatus is also fitted with another safety device introduced by Messrs. Cutler—namely, vent-pipes to the air-valves. From each air-valve is carried a pipe leading to a rack fixed on the side of the superheater above the charging stage. A series of cocks are attached to the terminals of these pipes, and actuated automatically by the lever operating the stack-valve. During the period of gas making, the cocks are all opened; thus giving free vent for any leakage of gas from the vessels passing into the air-main through a leaky air-valve. Should any grit accumulate under an air-valve, and allow gas to pass, it is immediately seen and the valve is located. The oil-sprayers are constructed on Messrs. Cutler's latest arrangement. The sprayer works through a stuffing-box on the carburettor manlid, and, with suitable gearing, is withdrawn from the interior during the blow. On commencing the run, a lever is depressed which lowers the sprayer into its working position, and at the same time turns on the oil

The Buildings for the Devonport Water-Gas Plant.

supply. The act of raising the sprayer at the end of the run likewise turns off the supply.

Each section of the apparatus is fitted with dust interceptors, for arresting the coke dust which issues from the superheater chimney during the blow. Fine particles of coke are mechanically carried in the air-blast from the generator, and give trouble by depositing on buildings in proximity to the plant house. The dust is passed through water vapour and caused to precipitate by impingement on baffle-plates, and is withdrawn from the receiving-tank in the form of sludge. The sludge-valve is manipulated by means of a wire from the operating stage; and once a day the sludge is removed by drawing it off into a settling-tank placed outside the building on the ground level.

The circulating water and tar effluent arrangements have all received special attention; the method employed having for its result that the only product to be withdrawn is the tar for sale. An overhead tank, supported upon a framework of steel joists, forms the circulating water-tank, and holds the water which by gravitation falls to the scrubbers, and, issuing from them hot and tarry, passes through the washers and thence to the tar-separator. Here it is mechanically freed from tar, and pumped back to the overhead-tank. The tar is withdrawn from the separator direct into the road-tank for removal to the distillers. Occasionally a little additional water is supplied, so as to compensate for unavoidable evaporation. A sight-feed arrangement is provided on the water supply to the scrubbers, by which the operator is able to regulate from the operating-stage the flow of water to these vessels. A secondary water supply is provided from the overhead tank to the washer.

All the machinery is in duplicate; each unit being capable of serving the two sets of apparatus working simultaneously. The engines are of Tangye's "Archer" type, double-cylinder vertical, of 35-horse power, running at 300 revolutions per minute, and driving No. 7 Sturtevant blowers. The engine-room also contains the necessary oil, circulating water, and boiler-feed pumps, and rotary meter. The two steam-boilers are of the Lancashire type, with special stamped ends. They are 6 ft. 6 in. diameter by 20 ft. long; and each boiler is capable of supplying steam for the two plants.

The steel building in which the whole of this installation is located consists of joist stanchions strongly braced together with horizontal angles, which form the purlins for the attachment of the corrugated galvanized sheets. A brass plate fixed above the operating floor records the date of the inauguration of the plant, the names of the Chairman and Members of the Gas Committee, of the Mayor, the Town Clerk, the Contractors, and the Engineer (Mr. Buckley).

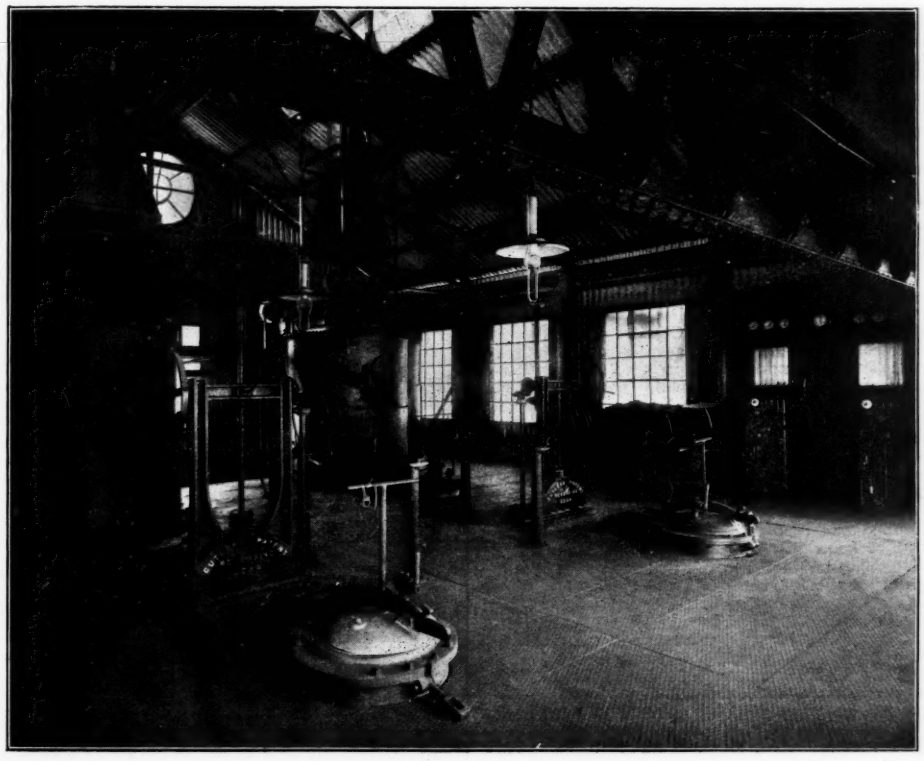
On the arrival of the visitors at the gas-works, they were received by Alderman W. Hornbrook, the Chairman of the Gas Committee, and by Mr. J. W. Buckley, Assoc.M Inst.C.E., the Engineer and Manager of the works. A tour was then made of the older portion of the works,

including the two retort-houses, in one of which hand stoking is employed. On the arrival of the party at the door of the building in which the new water-gas plant is housed, Alderman Hornbrook invited the Mayor (Mr. W. J. Moon) to unlock it, and presented him with a gold key as a souvenir of the event. The Mayor said he had pleasure in taking over the plant from the Contractors on behalf of the people of Devonport, and hoped that the light which would emanate from it would be in every way satisfactory. Not long since Devonport was not more than half lit; but through the energy and zeal of their Engineer, the town did not suffer inconvenience on this account. With the extensions and additions now made, they hoped the supply would be sufficiently maintained for many years to come.

Inside the building, Mr. Buckley gave a brief description of the plant, and said that practical experience during the last few months had shown that they could, if necessary, manufacture considerably more than the 800,000 cubic feet of water gas which the plant was designed to produce. Alderman Hornbrook formally started the machinery, and a practical demonstration was given of the process of gas making. Finally an inspection was made of the remaining features of the works, including the new purifying-house, and two new buildings adjoining—one of which is now used as a station-meter house, though it was meant for the storage of oxide, while the other contains the carburetting plant. In this portion of the works, the oil-tank and relief gasholder in connection with the water-gas plant had also been placed; and the visitors were able to appreciate the quickness of the process of water-gas making by seeing the holder rise.

On leaving the works, the party proceeded by special tram-cars to the Guildhall, where they were entertained to luncheon by Alderman Hornbrook. The chair was occupied by Alderman Hornbrook. Among those present were Sir Joseph Bellamy, the Chairman, Dr. J. H. L. May, the Deputy-Chairman, Mr. Percy S. Hoyte, the Engineer and Manager, and Mr. H. B. Heath, the Secretary, of the Plymouth and Stonehouse Gas Company; Mr. H. J. Dobell, the Chairman, Mr. Bate and Mr. Doidge, Directors, and Mr. A. Francis, the Secretary, of the Tavistock Gas Company; Mr. R. Beynon (Torquay), Mr J. W. Nicholls (Penzance); Mr. Samuel Cutler, Mr. Samuel Cutler, jun., Mr. F. Templer Depree, and Mr. T. Glanfield (Exeter), &c.

Sir Joseph Bellamy proposed the toast of "Success to the Gas Undertaking," and said he had great pleasure in congratulating the town in having gas-works which were in one respect, at least, thoroughly up to the mark—and that was in the latest addition they had made. His idea of the cheapest way of supplying gas to Devonport would have been to lay a main from Plymouth. This would have saved a good deal of capital expenditure, and they might have had gas at much less than it now cost. But the motto of the neighbouring towns was, "We will retain our independence, and hang the expense." As to the carburetted water-gas plant, they had a similar installation at the Plymouth works, put in by the same firm, which had given excellent service for years; and he was quite certain that the results of the Devonport installation would be equally satisfactory. He was much struck with some of the new buildings put up at the Devonport works. Money had evidently not been spared upon them. He also saw a very



The Operating Floor of the Water-Gas Plant.

fine new gasholder, which he understood was not likely to be so useful as the carburetted water-gas plant. He hoped some day the Plymouth Gas Company might be able to strike a bargain with them for this holder and buy it from them, not at scrap price, but a little more. When he saw some years ago that they had started electricity works in Devonport, he thought it was to extinguish gas altogether; but he was pleased to know that they had come to the same conclusion as himself, that after all gas was not played out. Progress would no doubt be made by both, and there would be friendly rivalry between the two Committees, both striving for the welfare of the town. He had had the pleasure of knowing Mr. Buckley, their Engineer, since he came to Devonport, and he had known of him before; and he had the highest opinion of him. He had known their Chairman for years. Like himself, Mr. Hornbrook sometimes put his foot in it—perhaps through too much zeal and impetuosity. Whatever his opinions on certain subjects, as Chairman of the Gas Committee they had in him a man actuated by an intense desire to do his best for the people of Devonport. He had pleasure in renewing his acquaintance with Messrs. Cutler and Son, and in congratulating Devonport on having had them as Contractors. At Plymouth, their experience of the work done by the firm was perfectly satisfactory, and he had much pleasure in adding this testimony to substantiate what they had all seen that day of the excellent appearance of the firm's work. He wished every prosperity to the new undertaking. One effect of it would be that Devonport would dump less coke into Plymouth, and the question of supply and demand would be more equally met. If anything could be done by way of interchange of ideas, or in any other way that would be mutually advantageous, they might rely upon the Directors and officials of the Plymouth and Stonehouse Gas Company to do all they could.

Alderman Hornbrook, in reply, thanked Sir Joseph Bellamy for this offer, and for his friendly references generally to the gas undertaking. It was in large measure owing to what the Chairman of the Plymouth Gas Company told him of the success of the installation at Plymouth that they in Devonport now had this installation of carburetted water gas. He did not wish to indulge in recriminations; but he should like to point to the fallacy of some of the objections which were raised to the installation. They were, in the first place, told that the cost would be £15,000. He said then that this was an exaggeration, and that it would not cost more than £10,000; and now the whole thing was completed, they found that it would be several hundred pounds below £10,000. Then it was said that they could not put down a carburetted water-gas plant because there was not sufficient space at the works. They had seen that there was space enough for at least two or three such installations and half-a-dozen oil-tanks, if they wanted them. Another fallacy with regard to it was that there would be an intolerable nuisance. This was cruel, and bitter, and unfair; but people in the locality said now that there was not half the nuisance they had had previously. They had been manufacturing water gas for four months, and Devonport had been burning it for that time and had not known it. The only complaint they had had was one which came in a month before they began. There was a saving of several pence per 1000 feet in the manufacture of carburetted water gas as compared with coal gas, and the Committee were more than ever satisfied that they had done the right thing. As to the new gasholder, he did not know what they were going to do with it. When Devonport had amalgamated Plymouth and municipalized the Plymouth Gas-Works, they would find a use for it, which they had not at present. As to the future, he had no doubt that both gas and electricity would be useful, and that there would be developments for both. The aim of the Gas Committee would be to combine economy with efficiency.

Mr. F. Templer Depree, the Chairman of Messrs. Willey and Co., proposed "Success to the Town of Devonport," and said that they had in the new installation a very complete and excellent plant; and he congratulated the Contractors upon the way in which the work had been carried out.

The Mayor, in reply, referred to the completion of the purchase of the water undertaking as a step in the right direction, and said that, though the new gasholder would be an eyesore for years, the present Chairman of the Gas Committee was not responsible for that.

Mr. F. Paul, the Deputy-Chairman of the Gas Committee, in proposing "The Engineer and Contractors," said that Mr. Buckley had displayed great energy, and had transformed the gas-works from a scattered and disorganized condition to a specimen of order, system, and compactness. At his suggestion, they dropped the system of carrying coal in bags, and conveyed it from the wharf to the gas-works in open carts, and thus saved £500 a year. The laying of an oil-main from the quay for pumping up the oil from the ship to the gas-works, which was also done at Mr. Buckley's suggestion, had been described as one of the smartest pieces of work undertaken in the town. As to the condition of the works in general, it was hardly like the same place as it was a year ago. Mr. Buckley had won the confidence of the Gas Committee, and his energy and zeal assured him of the confidence of the ratepayers. Messrs. Cutler and Sons had carried out the contract in a very satisfactory way; and he was positive that Devonport would never regret having placed the work in their hands.

Mr. Buckley said that at the time of his appointment he had heard and read so much about the Devonport Gas-Works that he was determined not to go near them, so that he would not have to commit himself in advance to any opinion respecting future requirements. It was the fact that there would be plenty to do which led him to desire to come there. The feeling between the Chairman, the Committee, and himself had made the work a pleasure. By the increased production of sulphate of ammonia, the profit from that department of the undertaking had been increased by £660 in the past year. Before coming to Devonport, he had been in the fortunate position of having a carburetted water-gas plant under his charge for five or six years. He had also scoured Germany, Switzerland, and Belgium, and had come back satisfied that the system was the right one to adopt. There were advantages in a plant of this kind which could not be all put upon paper. Had he been in Devonport when the matter of the gasholder was under consideration, he should have said that one advantage of water gas was that they might keep down the capital expenditure on gasholders. The relations between himself and the Contractors had been most satisfactory. They were making water gas at a cheaper rate than coal gas; but it must be remembered that they were paying in interest and sinking fund on their works no less than 1s. per 1000 feet of gas sold. During the four years that the Corporation had been in possession of the works, the consumption of gas had increased by no less than 20 per cent., and they must look to increased consumption to reduce the cost. It was a pitiful story that, while £50,000 or £60,000 had been spent on the works, it had not been spent in the direction which decreased the cost of production. The lungs of a gas undertaking was the retort-house. They were working in the retort-house at Devonport on lines which were considered up to date fifty years ago. This was not the right thing to be doing, and they must remedy it if they were to have more economical production. The Gas Committee would, he hoped, consider this in the near future.

Mr. Samuel Cutler also replied, and said it had been a great pleasure to his firm to know that the work had been satisfactorily carried out, and also to hear what Sir Joseph Bellamy had said of the work which they did for the Plymouth Gas Company. Mr. Cutler asked the Chairman to accept a silver tea and coffee service, inscribed: "Presented by the Contractors, Messrs. Samuel Cutler and Sons, to Mr. Alderman W. Hornbrook, J.P., the Chairman of the Gas Committee, on the occasion of the inauguration of the carburetted water-gas plant at the Devonport Gas-Works, 11th July, 1906."

The Chairman briefly acknowledged the gift.

Mr. R. J. Fittall, the Town Clerk of Devonport, in proposing "The Visitors," remarked that in Devonport they had embarked on municipal trading extensively. After litigation on the scale of a miniature "Jarndyce *v.* Jarndyce," they had acquired the water-works. If the Committee embarked on moderate capital expenditure which would equip the works for many years to come, there was no reason why the water undertaking should be a great burden to the rates. They had the gas and the electricity supply in their hands, and there was room for both.

Mr. J. H. Ellis, the Town Clerk of Plymouth, in responding, referred to his previous acquaintance with Mr. Buckley when he was himself Town Clerk of Southport and Mr. Buckley was connected with the Corporation gas-works in that town.

On the invitation of the Mayor, the health of the Chairman was drunk and the company separated.

At the meeting of the Town Council on Thursday, it was reported that the new gasholder which had been constructed by Messrs. Clayton, Son, and Co., Limited, was completed. Mr. S. A. Perkins asked whether it was true that the holder was useless or would become useless owing to the installation of the new water-gas plant. If that were so, a good many thousand pounds had been wasted, and it would have been much better to stop the work instead of incurring the whole expense. Another member sarcastically suggested that if the holder was of no use it should be removed so that people in the neighbourhood might not have their view interrupted. Alderman Hornbrook said the Gas Committee were thoroughly satisfied that they could have done without the holder. But they had it, and they would try to make use of it. One thing it would enable them to do would be to say to the men on a Saturday that they could go home and need not return until Monday, for they could store sufficient gas to last over Sunday.

Mr. J. M. Edney, a Berwick councillor, has been appointed Secretary of the Berwick and Tweedmouth Gas Company, in succession to the late Mr. T. G. Turner.

THE FACTORS THAT INFLUENCE CARBONIZATION RESULTS.

At the Annual Meeting of the Western (U.S.A.) Gas Association, a short paper dealing with the above subject was read by Mr. W. E. Hartman, the Superintendent of the Joliet (Ill.) plant of the Western United Gas and Electric Light Company.

The author remarked that probably no branch of the gas industry offers a more fertile field for research than the process of carbonization. A search through our technical literature shows that very little has been learned of the thermo-chemical changes which the coal and the gas undergo in the retort. It is generally admitted that at high carbonizing temperatures the gas is overheated. Accordingly, some advocate low heats, being satisfied with relatively low yields of gas, and avoiding excessive production of lampblack and naphthalene. Others advocate high heats with high yields, and have various special methods to overcome the inconvenience attending them.

Experiments were undertaken by the author with a view to learning something of the relative composition and calorific value of coal gas produced under different specified conditions. The retorts used were 16 in. by 28 in. and 9 feet long, in a full-depth setting of six; and the coal was Pennsylvania gas coal of uniform size throughout the tests. The charging was done by hand. The heats on the setting were regulated to thoroughly carbonize the charge in four hours in each case; the yield of gas being from 5 to 5·05 cubic feet per pound of coal. The analyses were made from three samples of gas from each charge—one taken half-an-hour after charging; the second, two hours after charging; and the third, half-an-hour before drawing. Several check analyses were made in each case, and the results averaged. The point of sampling was on the ascension-pipe, 2 ft. 6 in. above the mouthpiece. The temperature of the gas was noted throughout each charge, at a point in the pipe 11 feet above the mouthpiece. The heat units were calculated from the analyses, assuming the illuminants as ethylene, and using the following values for the units per cubic foot: Ethylene, 1681; carbon monoxide, 343; hydrogen, 344; methane, 1072. The results are given in the accompanying table.

The first series of experiments show the influence of the size of the charge upon the quality of the gas; the second the influence of the length of the retort upon the quality. In this connection, there is given a table showing the comparative analyses and calorific values of gas made in a 21-feet retort and in a 10-feet retort. These analyses were made in Detroit in 1899, and under different conditions from those given in the other tables; but they also show the inferiority of gas made in long retorts. The third and fourth series of experiments show the effect of insulating the top wall of the retort, making this part less conductive of heat, and thereby protecting the hydrocarbons in the gas from decomposition.

The author thought these results indicated that the present pattern of retort is not adapted for making gas of the best quality when carbonization is carried on at high temperatures, as evidently the upper part of the retort becomes too hot for good results. More heat enters the retort through the upper wall than is needed to properly fix the gas. Consequently, the hydrocarbons suffer decomposition, and lampblack and naphthalene are formed. Conditions seem to demand a high carbonizing temperature in the lower part of the retort, and a lower temperature—merely a fixing one—in the upper part. It has been shown that the difficulty is seriously aggravated by the use of long retorts, and is only partially overcome by heavy charging. The foregoing experiments appeared to show that a remedy lies in the proper insulation of the upper wall of the retort.

The following remarks on the paper were communicated by Mr. J. R. Lynn: The paper presents a most interesting subject—one neither hashed nor rehashed in the past; and the points are clearly and concisely given. That the amount of the charge of coal per retort has a material effect not only on the quality, but also on the quantity of gas produced, is a proposition entitled by age to respect without any discussion. Referring to Table II., 4 ft. 6in. retorts are purely experimental, and of no practical value in the production of gas as a commercial commodity. Such construction necessarily involves radiation loss, and consequent increase of fuel consumption to an extent that prohibits its adoption. The data in Table III. were originally prepared to illustrate the advantage (more imaginary than real) gained by converting a through retort of 21 feet in length into two 10-feet retorts. For operating purposes, a larger quantity of coal should have been charged into the through retorts than into the shorter ones, since by the construction of the division wall the best 12 inches of space in the retort was put out of commission, and at least 7·5 per cent. of its efficiency eliminated. Furthermore, as the through retorts at the Detroit works were provided with separate mouthpieces, ascension pipes, &c., at each end, they were, for all practical purposes, 10 ft. 6 in. retorts, and the comparison does not really apply. Cells and other conditions being the same, whenever the gas produced passed each way, only a small proportion travelled from 1 to 6 inches further than in a 10-feet retort. During my connection with the Detroit Company,

TABLE I.—*Influence of Size of Charge on the Quality of Gas.*

Kind of Retort.	Size of Charge, Lbs.	Time of Sampling.	CO_2 and H_2S.	C_2H_4	O.	CO.	H.	CH_4.	N.	B.Th.U. per Cub. Ft.	Max. Temp. of Gas 11 Ft. above Mouthpiece Deg. Fahr.
	300	½ hour after charging	3·0	6·8	0·3	8·0	38 4	41 6	1·9	..	428
		2 hours ,, ,,	1·0	0·8	0·1	6·8	55·0	27·9	8·4	..	
		½ hour before drawing	0·6	0·2	0·0	7·5	70·6	10·3	10·8	..	
		Average	1·5	2·6	0·1	7·4	54 7	26·6	7·1	543	
	400	½ hour after charging	3·1	8·2	0·8	7·2	34·8	45·2	0·7	..	522
		2 hours ,, ,,	2·3	3·5	0·2	7·1	49·3	31·1	6·5	..	
		½ hour before drawing	0·0	0·2	0·1	5·6	78·7	8·4	7·0	..	
		Average	1·8	4·0	0·4	6·6	54·3	28·2	4·7	579	
	500	½ hour after charging	2·6	8·1	0·4	7·3	35·0	44·6	2·0	..	504
		2 hours ,, ,,	2·6	3·0	0·0	6 3	45·8	34·8	7·5	..	
		½ hour before drawing	1·4	0·4	0·1	6·1	60·8	24 4	6·8	..	
		Average	2·2	3·8	0·2	6·6	47·2	34 6	5·4	620	

TABLE II.—*Influence of Length of Retort on the Quality of Gas.*

Retort 9 ft. long	400	½ hour after charging	3·1	8·2	0·8	7·2	34·8	45·2	0·7	..	522
		2 hours ,, ,,	2·3	3·5	0·2	7·1	49·3	31·1	6·5	..	
		½ hour before drawing	0·0	0·2	0·1	5·6	78·7	8·4	7·0	..	
		Average	1·8	4·0	0·4	6·6	54·3	28·2	4·7	579	
Retort 4·5 ft. long	200	½ hour after charging	2·5	7·4	0·0	7·3	39·6	41·8	1·4	..	220
		2 hours ,, ,,	2·2	3·5	0·1	6·5	46·0	35·7	6·0	..	
		½ hour before drawing	0·0	0·2	0·0	4·5	70·9	20·1	4·3	..	
		Average	1·6	3·7	0·0	6·1	52·2	32·9	3·5	615	

TABLE III.—*Influence of Length of Retort on the Quality of Gas.* (*Results in Detroit*, 1899)

Retort 21 ft. long	No data.	½ hour after charging	2·6	3·0	0·7	7·3	22·1	57·3	7·0	..	790
		2½ hours ,, ,,	0·8	0·2	0·0	3·7	62·8	28·9	3·6	..	
		3½ ,, ,, ,,	0·0	0·0	0·0	2·8	77·0	15·4	4 8	..	
		Average	1 1	1 1	0·2	4·6	54·0	33·9	5·1	583	
Retort 10 ft. long	Half as much as in 21-ft. retort.	½ hour after charging	2·7	4·9	0·2	5·7	26·6	55·0	4·9	..	466
		1¾ hours ,, ,,	1·1	2·2	0·1	3·7	48·8	39·0	5·1	..	
		3½ ,, ,, ,,	0·4	0 7	0·0	3 5	61·6	27·1	7·7	..	
		Average	1·4	2·6	0·1	4·0	45·7	40·4	5·8	648	

TABLE IV.—*Effect of Thickening Top Wall of the Retort.*

[This was accomplished by laying a row of tiles, 2 inches thick and 12 inches wide, along the top of the retort.]

Top Wall of the Retort.											
Ordinary	300	½ hour after charging	3·0	6·8	0·3	8·0	38·4	41·6	1·9	..	428
		2 hours ,, ,,	1·0	0·8	0·1	6·8	55·0	27·9	8·4	..	
		½ hour before drawing	0·6	0·2	0·0	7 5	70·6	10·3	10 8	..	
		Average	1·5	2·6	0·1	7·4	54·7	26·6	7·1	543	
2-inch tile on top	300	½ hour after charging	2·8	8·7	0·2	6·5	30·9	49·9	1·0	..	..
		2 hours ,, ,,	1·4	3·9	0·3	5·9	46·4	33·4	8·7	..	
		½ hour before drawing	0 2	0·2	0·1	3·8	72·7	13·5	9·5	..	
		Average	1·5	4·3	0·2	5·4	50 0	32·3	6·3	609	
Ordinary	400	½ hour after charging	3·1	8·2	0·8	7 2	34·8	45 2	0·7	..	522
		2 hours ,, ,,	2·3	3·5	0·2	7·1	49 4	31·1	6·5	..	
		½ hour before drawing	0·0	0·2	0·1	5·6	78·7	8·4	7·0	..	
		Average	1·8	4·0	0·4	6·6	54·3	28·2	4·7	579	
2-inch tile on top	400	½ hour after charging	2·3	7·2	0·0	7·4	35·0	42·8	5·3	..	422
		2 hours ,, ,,	1·3	3·1	0·0	6·8	48·3	34·4	6·1	..	
		½ hour before drawing	0·0	0·4	0·0	5·0	62·7	22·8	9·1	..	
		Average	1·2	3 6	0·0	6·4	48·7	33·3	6·8	607	

TABLE V.—*Effect of Additional Thickening of Top Wall of Retort.*

[The row of tile previously placed on top of the retort was covered with a 3-inch layer of fire clay and mineral wool.]

Top Wall of the Retort.											
Ordinary	300	½ hour after charging	3·0	6·8	0·3	8·0	38·4	41·6	1·9	..	428
		2 hours ,, ,,	1·0	0·8	0·1	6·8	55·0	27·9	8·4	..	
		½ hour before drawing	0·6	0·2	0·0	7·5	70·6	10·3	10·8	..	
		Average	1·5	2·6	0·1	7·4	54·7	26·6	7 1	543	
2 in. of tile and 9 in. of fire-clay and mineral wool	300	½ hour after charging	3·0	9·3	0·2	6·1	28·4	53·0	0·0	..	340
		2 hours ,, ,,	2·1	3·3	0·1	5·3	47·6	35·7	5·9	..	
		½ hour before drawing	0·0	0·1	0·3	1·3	76·0	11·4	10·9	..	
		Average	1·7	4·2	0·2	4·2	50·7	33·4	5·6	617	
Ordinary	400	½ hour after charging	3·1	8·2	0·8	7·2	34·8	45·2	0·7	..	522
		2 hours ,, ,,	2·3	3·5	0·2	7·1	49·3	31·1	6·5	..	
		½ hour before drawing	0·0	0·2	0·1	5 6	78·7	8·4	7·0	..	
		Average	1 8	4·0	0·4	6·6	54·3	28·2	4·7	579	
2 in. of tile and 3 in. of fire-clay and mineral wool	400	½ hour after charging	2·2	8·6	0·3	6·3	30·9	51·3	0·4	..	396
		2 hours ,, ,,	1·8	4·5	0·2	6·5	45·8	36·8	4·4	..	
		½ hour before drawing	0·1	0·8	0·0	4·7	62·9	22·7	8·8	..	
		Average	1·4	4·6	0 2	5·8	46·5	36·9	4·6	653	
Ordinary	500	½ hour after charging	2·6	8·1	0·4	7·3	35·0	44·6	2·0	..	504
		2 hours ,, ,,	2·6	3·0	0·0	6·3	45·8	34·8	7·5	..	
		½ hour before drawing	1·4	0·4	0·1	6·1	60 8	24·4	6·8	..	
		Average	2·2	3·8	0 2	6·6	47·2	34·6	5·4	620	
2 in. of tile and 3 in. of fire-clay and mineral wool	500	½ hour after charging	3·4	8·2	0·2	7·0	35·7	45·5	0·0	..	428
		2 hours ,, ,,	2 3	5·0	0·3	6·8	42·3	39·3	4·0	..	
		½ hour before drawing	0·7	2·3	0·7	5·7	51·8	31·5	7·3	..	
		Average	2·1	5·2	0·4	6·5	43·3	38·8	3·7	675	

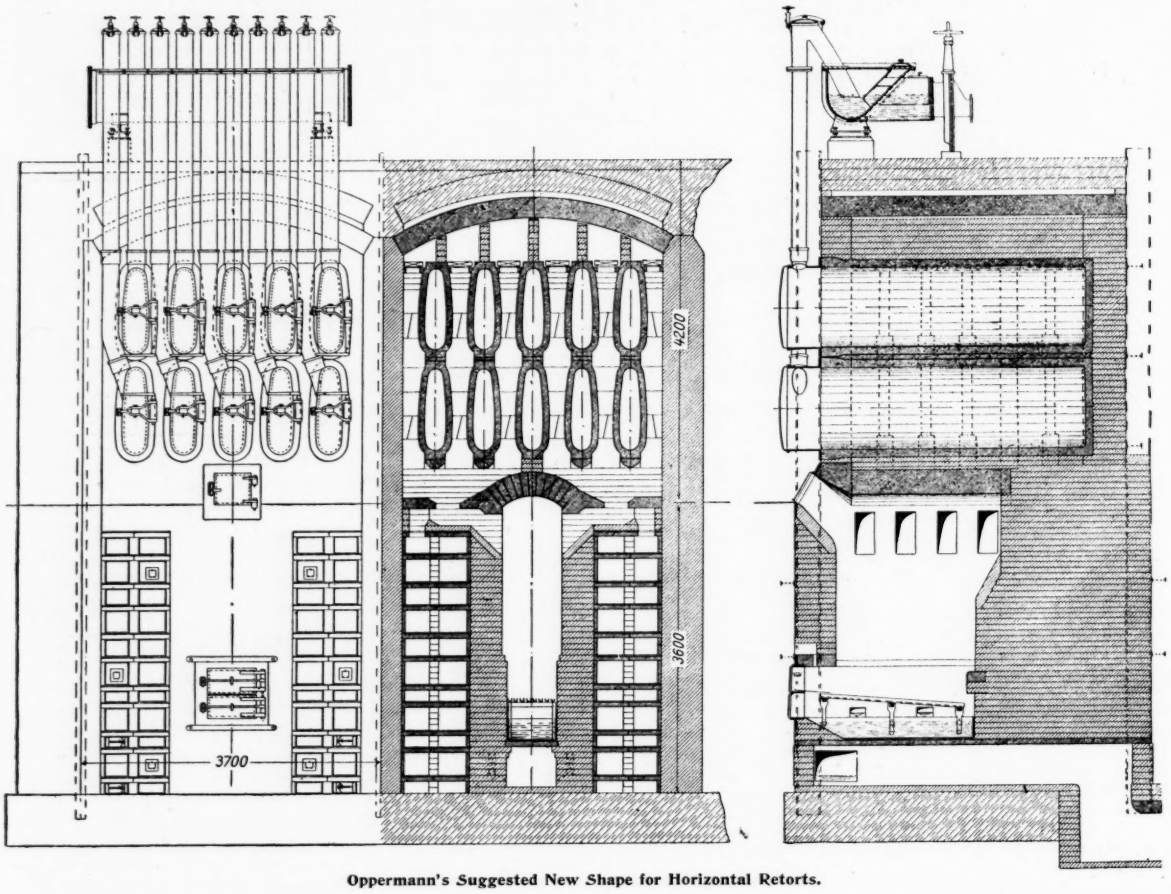
these retorts made good gas, plenty of it, and we did not have any trouble we were not able to deal with at any time. Tables IV. and V., illustrating the effect of thickening the top of the retort, present interesting figures; but it is not demonstrated that the cost of making such a change is justified by results. Taking the data throughout, the operations are striking; and it is likely that experiments covering a larger and more continuous period along the same lines would, if carefully and accurately tabulated, present phases even more striking and more unaccountable. There is no piece of mechanism about gas-works that presents so much individuality as the bench. Two benches of the same design, and erected by the same workmen, each a

prototype of the other, and standing side by side in the same building, frequently disclose different characteristics in results of operation. Why is this? The man who can reply should reap a rich reward. Mr. Hartman's effort should be an aid to others investigating along this line, for the subject of carbonization contains many unsolved problems. It will be found uniquely rich in this respect.

Replying to these remarks, Mr. Hartman said: The experiment noted in Table III. was made in Detroit in 1899, with retorts 21 feet long. The retorts had two ascension-pipes, one at either end. Practically the two pipes proved no better than one. The retort-house conditions were such that it was a very difficult matter to have two ascension-pipes equally clear; or if they are clear, it is difficult to have the hydraulic mains in the two sets clear and in good practical working condition. It was found there that most of the gas travelled one way; and for this reason two retorts with one ascension-pipe in Detroit at that time would have been as good. Mr. Lynn states that good gas was made in Detroit while he was there. I do not know anything about that. I know that the conditions were very unsatisfactory with the two retorts at the time these experiments were made; and as the result, the retorts were bricked up in the centre and run as 10 feet retorts. It saved considerable labour on the hydraulic main. The paper is intended merely to summarize some experiments. It is experimental work; and it is not claimed that the results are conclusive. They were conclusive for the conditions under which they were obtained; but they are only given by the author as experimental.

A NEW SHAPE SUGGESTED FOR HORIZONTAL GAS-RETORTS.

In a recent number of the "Journal für Gasbeleuchtung," Herr W. Oppermann, of Arnsberg, suggests a new shape for the construction of horizontal coal-gas retorts, and gives a set of drawings of a brick-setting to contain ten of them.



Oppermann's Suggested New Shape for Horizontal Retorts.

The author begins his article by pointing out that inclined and vertical gas-retorts have defects as well as advantages of their own; that the precise practical value of vertical retorts is not yet fully settled; and that both the vertical and the inclined systems of building gas-retorts are too expensive for small and medium-sized works to adopt. Putting these new systems of construction on one side, however, it is strange to notice that no attempts have been made during the past ten years or more to alter or improve the design of horizontal retorts. The furnaces and settings have been modified and rendered more efficient; but the retorts themselves still retain the ⌂-shape they were given some thirty or forty years ago, when carbonization temperatures were much lower than those which, in the vast majority of cases, prevail at the present time.

Based on Dr. Bueb's statement that the experimental vertical retorts at Dessau yield a gas containing 50 per cent. less napthalene than the gas evolved in horizontal retorts of conventional design, Herr Oppermann has come to the conclusion that the ⌂-retort should be abandoned in favour of an elliptical or egg-shaped cross-section—the major axis of the ellipse being disposed vertically, and the "large end" of the egg being downwards. When a ⌂-shaped retort is charged in the ordinary way, the coal only touches some 50 per cent. of the inner surface of the retort; the remaining 50 per cent. being in contact with the gas. In the Oppermann improved elliptical retort, the coal touches at least four-fifths of the internal surface; and the remaining one-fifth is quickly reduced in area as the coal swells. Hence, in comparison with the ⌂-retort, the elliptical retort possesses a much smaller heating surface free to act prejudicially upon the gas; while, moreover, the free space inside is so much less that the gas is hurried into the ascension-pipe before the usual quantity of naphthalene has been formed.

Other advantages are claimed on behalf of the elliptical horizontal retort. The setting shown in the accompanying engravings contains ten retorts. If the major axis of the ellipse is 39·4 inches, the radius of the lower curve 5·5 inches, and the radius of the upper curve 3·2 inches, each 10-foot retort will then hold nearly 7 cwt. of coal; and the make of gas will be 50 per cent. higher per unit of ground surface occupied by the setting than usual. The elliptical retorts are said to be just as easy to charge and draw mechanically as ⌂-retorts; and with the aid of the most modern machinery, the make of gas, per unit of ground surface, may be 100 or 150 per cent. more than is possible with ⌂-retorts. The elliptical retorts also lend themselves to the construction of a firm and strong setting, better than ordinary ⌂-retorts.

A German patent for this system of designing coal-gas retorts has been applied for. Hitherto they have not been tested on the large scale; but as their employment involves so little alteration in existing brickwork, it is hoped that experiments may be instituted shortly.

BRITISH ASSOCIATION OF WATER-WORKS ENGINEERS.

ANNUAL MEETING AT SCARBOROUGH—JULY 12 to 14, 1906.

SCARBOROUGH extended to the British Association of Water-Works Engineers last week a whole-hearted welcome; and the visit to the celebrated town and health resort can be looked back upon from all points of view with felicitous feelings. Technically, the meeting was of a highly successful character; and the pleasure that intervened the three business sittings was far above commonplace, owing to the natural charms of the town and its outskirts. The personal factor of success was also strongly marked. The Mayor (Alderman W. Hastings Fowler), the Corporation, and the officials of the historic borough, appeared to regard it as nothing but their simple duty to do their utmost in aiding the President for the year—their own Water Engineer of some fifteen years' standing, Mr. William Millhouse, Assoc M.Inst.C.E.—and the Secretary, Mr. Percy Griffith, to make the meeting one of perennial happy memory. And they succeeded.

Regarding the technical proceedings, they were varied; and, judging by the well-maintained attendance throughout, notwithstanding the attractions immediately beyond the Council Chamber, the subjects under discussion admirably conformed with the tastes of the members. They are too numerous to receive particular attention outside the report which we commence to-day, and shall continue in succeeding issues. But there are a few general points in the President's Address, which were supplemented by other references during the week, to which allusion may be made. The usefulness of the Association is well established in recorded history; but the members are as ardent as ever in their desire to enhance that usefulness, not only to themselves but to the local authorities, companies, and communities that they serve. This was a fundamental feature of the President's Inaugural Address; it is spoken of as the primary object of the revision of the rules, which in their altered form were unanimously adopted at a private meeting of the members; and Mr. Easton Devonshire made a point of it at the dinner on Friday night. Considered apart from the broader influence of the work of the Association upon water supply generally, by the internal power of that work the status of the water engineer is gradually being raised, and that is a coincidental personal advantage for which the members of the Association may well look and aim. The duties and responsibilities of a water engineer are second to none in professional engineering; and this deserves the fullest public recognition. The incorporation of the Association at a later date is being talked about; and this would be a movement upwards. Why there is delay we do not understand, as there are Associations with considerably smaller memberships than 300 or more that have the added dignity with which incorporation under the Companies' Acts invests them. The Association, however, are now being taken into counsel by public authorities on special matters upon which the members are eminently competent to advise; and this will increasingly continue.

In another way the organization supplies a want, of which it is to be hoped that full advantage will be taken. Important as is the water supply of the country, there has hitherto been no central depository for statistics and information. The archives of water undertakings must be rich in information that collated would be of vast usefulness; but while steadily growing, the value of that information, in its immured state, is largely lost both to science and the advantage of the country generally. Mr. Easton Devonshire has made a further suggestion which would also add to the financial stability and resources of the organization, and have an educational influence—the admission, as associates, of the chairmen and members of water committees and water company directorates. However good directors and committee men may be, as business men, for such special work as the administration of water and gas undertakings, their presence at meetings of the chief professional organizations would undoubtedly expand their knowledge, expedite their decisions upon the recommendations of their professional advisers, and extirpate some of that narrow-mindedness which impedes improvement in necessary directions. The suggestion is not without precedent, as witness the names of Chairmen and members of Electricity Committees on the roll of membership of the Incorporated Municipal Electrical Association.

The Inaugural Address of the President indicated several directions in which the Association are working—notably in connection with the Joint Committee on Water Regulations—and others which they have in view, such as the revision of the general law appertaining to water supply; and the control of water areas throughout the country by means of Water Boards. The President's views on water-works finance are expressed with spirited independence, and are framed with an agreeable broadness. He is not one who believes in the repayment period for loans being extended beyond the efficient life of a subject, nor is he in favour of an inequitable shortness of term. He also lays it down as a sound administrative principle that "every water undertaking "should have a depreciation fund." The address is a practical one; and its suggestiveness is its outstanding characteristic. That suggestiveness and the President's personal influence were palpable throughout the meeting, the success of which brought down copious congratulation before the conclusion of the final sitting.

REPORT OF THE PROCEEDINGS.

GLORIOUS weather welcomed the members of the Association to Scarborough last week for their Eleventh Annual General Meeting; and the weather itself was typical of the warmth and heartiness of the reception accorded by the Mayor (Alderman W. Hastings Fowler, J.P.) and the Corporation, on behalf of the town. The President for the year (Mr. W. Millhouse, Assoc.M.Inst.C.E.) is the Corporation Water Engineer, who has held the position since January, 1891; and, in the time that has elapsed, he has carried out some important extensions of the water-works that the expanding necessities of the popular seaside resort have demanded.

Most of the members journeyed to Scarborough on Wednesday; and on Thursday morning, the proceedings were opened in the Council Chamber of the Town Hall; there being at the time one of the best attendances ever recorded.

An Official Welcome.

The Mayor—who was accompanied by Alderman W. C. Land, Alderman V. Fowler (the Chairman of the Corporation Water Committee), Alderman Tonks, and Councillors Taylor, Whittaker, and Dennis—attended to offer a hearty welcome to the members.

His WORSHIP, addressing the members, said this was the third occasion during his Mayoralty that it had fallen to his lot to welcome public bodies such as theirs. At Easter he had the privilege of receiving the National Union of Teachers; about a month ago he had to offer a welcome to the Association of Municipal Engineers; and now he had to welcome the British Association of Water-Works Engineers. He thought he could claim that the connection of water-works engineers as a body with municipal work was possibly, in one sense, the most important of all. They could educate their children, and that was represented by the National Union of Teachers; they could have their streets, buildings, and parks in perfect order, and that department of public work was represented by the borough engineers; but if, having done all these things, their water supply was inefficient or impure, he thought they could not claim to be an efficient municipality. Therefore he might venture to say that possibly no department of municipal work was more important, or came home more to them, than that of the water engineers. As a corporate body, they had a peculiar interest in welcoming the Water-Works Association, because, soon after he (the Mayor) vacated the chair, the presidency of the Association would pass into the hands of their Water Engineer (Mr. Millhouse). The Corporation felt that, in the placing of their Water Engineer in the Presidency of the Association, the members were greatly honouring the borough. Mr. Millhouse had worked in Scarborough for many years. He had the confidence and esteem both of the Corporation and of the whole town. He had done valuable work in connection with the water undertaking; and he (the Mayor) was quite sure no gentleman

the members of the Association could place in the chair was more worthy of the position than Mr. Millhouse. It was just possible some of the members might not have seen Scarborough before. If this was so, he could say, in welcoming them, that he was certain the town would answer their highest expectations. The beauty of the town was only rivalled by its antiquity, because, though the water undertaking was comparatively modern, it was a town whose municipal history went back close upon 800 years. Scarborough had, in fact, the honour of being one of the oldest boroughs in the Kingdom. He hoped the work of the members during the meeting would be tempered by a large amount of sight-seeing and pleasure. On behalf of the Corporation and the town, he offered them a sincere and hearty welcome. He hoped that it would not be the only occasion on which they would see the members in the town, because, at all times, the Corporation welcomed public bodies, and tried to show them courtesy.

Mr. P. H. Palmer (Hastings), the retiring President, said, on behalf of the Association, he had great pleasure in thanking his Worship and the Corporation for receiving the members so cordially. This was the first time he believed the Association, as a body, had been to Scarborough. It was a coincidence that last year they met at a very prosperous, well-known south-coast seaside resort [Hastings] ; and they were also cordially received there. Wherever the Association met, they invariably received from the Mayor and Corporation a very generous welcome. The Association was one that was doing a great deal of good in the country; and it had banded together the members of a very fine profession. As the Mayor had aptly put it, perhaps, the art of water engineering was the most important of any connected with the government of any community. The health of a town very largely depended upon the water supply; and in this respect alone, he thought that, speaking for the Association, municipalities ought to be very thankful when they had a good water-works engineer. He again heartily thanked the Mayor and Corporation for their kindness in receiving the Association in the generous manner they had done.

Mr. C. Sainty (Windsor) the Senior Vice-President, endorsed the remarks of Mr. Palmer—adding that the Association had been received by many corporate bodies in different parts of the country, and had always been heartily welcomed wherever they had had the honour of meeting.

The members cordially acquiesced in the acknowledgment to the Mayor and the Corporation; and his Worship made an appropriate reply.

Mr. Palmer then took the chair; and the business was at once proceeded with.

The Business Proceedings.

The Secretary (Mr. Percy Griffith) first read the minutes of the tenth winter meeting held at Burlington House, London, on Dec. 16, 1905; and they were unanimously confirmed.

A Transfer.

Mr. Palmer said he had to announce that Mr. W. F. Bird, of Midsomer Norton, Somerset, had been transferred to the class of members. He was elected an associate through some misunderstanding on the part of the Council. He ought to have been elected a member at the time of his nomination.

Induction of the New President.

Mr. Palmer said it was his pleasant duty to introduce the President-elect (Mr. Millhouse). He was a gentleman who was known to all the members. He had had a large experience as a water-works engineer, and had been associated with Scarborough and its water-works for many years. Mr. Millhouse would make a first-rate President, and would do all in his power to uphold the dignity and continue the prosperity of the Association. Without further words, he had much pleasure in asking Mr. Millhouse to take the chair for the ensuing year.

Mr. Millhouse took the chair amid the heartiest applause.

Thanks to the Retiring President.

The President said he had first to express his own sincere thanks for the honour the members had conferred upon him in placing him in the position of President, and to assure them that his best endeavours would be used in the interests of the Association. Before proceeding with his address, it was his pleasant duty to ask the members to accord a vote of thanks to their retiring President for the able and courteous manner in which he had conducted the business of the Association during the past year. They all of them wished him many years of health and happiness, and hoped that he would long remain a valued member of the Association.

Mr. Sainty, in seconding, remarked that their Ex-President was indeed a very valuable member of the Association. Mr. Palmer had done as much as was in his power to make the members happy, and had worked zealously for the success of the Association. He (Mr. Sainty) was pleased to say that the Association had improved its records since Mr. Palmer had been President; and he hoped they would proceed in the successful manner of the past year in the years to come.

The motion was enthusiastically adopted.

Mr. Palmer thanked the members sincerely for their vote. The past year had, he said, been a very pleasant one for him; and it had passed far too quickly—much more so perhaps than he had liked. It would be his pleasure to do all he could for the Association as long as he was able. They were, in his opinion, working on excellent lines, and had very good prospects before them; and the Association would no doubt in time to come be a very influential body.

The President then delivered the following

INAUGURAL ADDRESS.

Gentlemen,—Before commencing my address, will you permit me to say how greatly I esteem the honour you have conferred upon me in electing me President of this important Association, and in selecting Scarborough for the annual meeting, and to tender you my heartiest thanks.

In choosing the subjects for my address, the first which claims consideration is the well-being of our Association. I find that the number of members of all grades has increased during last year from 305 to 327—a small gain; but we must not forget that we have only a limited number of engineers to draw new members from. Many engineers having charge of water undertakings, being also borough or gas engineers, are prominent members of other Societies, and are naturally reluctant to increase the claims on their time and attention. The following table shows the position of the membership roll at the commencement of the last three years :—

Total Membership, January 1.	1904.	1905.	1906.
Hon. members	2	2	2
Members	197	200	206
Associate members, Class A	71	73	86
,, ,, ,, B	30	30	33
	300	305	327

The financial position of the Association is extremely satisfactory, as will be seen from the statement of accounts published in the last issue of "Transactions." As, however, the current year bids fair to produce a more satisfactory result than any previous one, the Council are considering various means by which the surplus funds can be utilized for the advantage of the members; meanwhile it has been decided to cancel from the balance-sheet the value of the stock of "Transactions," as this cannot but be considered a doubtful asset.

The issue of Certificates of Membership, which will take place as soon as the revision of the rules is completed, will, I am sure, give general satisfaction to the members, and tend to improve the status of the Association. Arrangements are also being made for improving the general style in which our "Transactions" are published; and in many other matters of detail the Council are doing their utmost to enhance the value of the Association to the profession in general and to members in particular.

The question of revising our rules has had further attention from the Council during the past year; and I trust that the revision to be presented to the members at this meeting will form the basis of a unanimous settlement of a very difficult problem. To this end, it is necessary that members holding strong views on any particular points should be willing to give way to the views of the majority. The question of incorporating the Association under the Companies Act has also been considered, and will probably be dealt with in the course of a few years, when another opportunity will arise for revising the rules, if necessary.

As regards matters of public interest, our Association has been doing useful, though not conspicuous, work. We have two delegates appointed to serve on the Joint Committee on Water Regulations, and, beyond these, 13 of our members

have been appointed to represent their respective towns and cities, and our Secretary has been appointed Assistant-Secretary to the Committee. At the present moment a draft code of regulations for the prevention of waste by consumers, together with schedules covering all technical points, such as the standardization of fittings, the registration of plumbers, &c., &c., have been submitted to the Local Government Board for their consideration and report. It is confidently hoped that in the course of a few months an official publication will be made which will prove the basis of a settlement of this vexed question.

The Engineering Standards Committee have had the matter of the standardizing cast-iron pipes before them for some time; and it is hoped they will shortly be in a position to issue some definite recommendations on the subject. This question was, as you will remember, initiated by our Association; and the Council are therefore anxious to see their action in this respect bear fruit.

From what I have said in regard to the work of the Association it will, I think, be admitted that we are doing useful work in the interests of our members and in those of the profession generally. That corporations fully appreciate our Association is shown by the way in which we have been received at the various cities and towns we have visited, abroad as well as at home. I hope that before long another Continental trip will be arranged—the previous one having proved a great success and a means of acquiring much useful information by those who took part in it.

The revision of the general water-works law, including the question of the control of water supplies throughout the country by means of Water Boards, has also been kept in view by the Council; and the first available opportunity will be taken to press this matter upon the Government for some official action to be taken. The large towns no doubt can and will take care of themselves; but small towns and rural areas require a re-adjustment of the law. A glance at a map showing the boundaries of the rural districts of Yorkshire, will show the unsuitability of such areas for districts of water supply. Towns and adjoining villages should be grouped, regardless of present boundaries, into water areas; the capital cost of works being charged upon the area so defined, and the water-rates collected independently. At present, two villages lying together, divided by a stream, decline to have one water supply. Again, a farm beyond the limits of supply of a village may have to pay a large proportion of the cost of the village supply, simply because it is in the same parish or contributory place. The tenant of the said farm has blocked the carrying out of a scheme of water supply for many years for the above reason. The prevention of new, and the removing of old, sources of pollution of streams should be more strongly taken in hand by a properly-constituted authority, and not left to small communities or individuals.

The main object to be attained by our Association is, in my opinion, to improve, as far as possible, the status of our members, so that the fact of being a member of our Association may be of real value to those holding the distinction. It is also necessary for us to take a prominent part in any general question affecting the interests of our profession; and to this end it is very desirable that members should undertake to collect data relative to questions of water supply, and, by epitomizing the same, make them available for the use of the Association as a body. Annual reports of water undertakings, with analyses and health statistics, will be welcomed by the Secretary; and if received in sufficient numbers, arrangements will be made for their publication in the "Transactions" in some form convenient for reference.

Rainfall and Water Supply.

Turning, now, to matters of more general importance to water engineers, we have again suffered from a season of prolonged drought; the summer and autumn of 1905 having had an exceptionally low rainfall. This has been very disastrous to many towns, and will have taught many and varied lessons, more particularly in regard to the necessity for preventing waste of water and the wisdom of extending works in due time before a shortage is actually realized.

In this town, it has been our good fortune never to have known what a deficient supply means since the water-works were established. As I have pointed out in my description of the Scarborough Water-Works, the water here is obtained from the coralline oolite limestones and grits. Some of these rocks are of close-grained, hard, solid sandstone, interleaved, so to speak, with broken and fissured rocks. This combination is most favourable in respect of the underground water supply; the solid rock holding the water for a very long period, while the fissures carry the surplus forward to the natural underground reservoirs formed by faults. The effect has been most noticeable at the Scarborough works, where the wells have maintained a yield equal to two-thirds of the maximum throughout the period of drought.

The outcrop of the strata, from which the Scarborough supply is drawn, is about 17 square miles in area. With an annual rainfall of 30 inches, 7400 million gallons of water would fall on this area, most of which would sink into the ground and follow the dip of the strata in a southerly direction until dammed up by the faults already referred to. Copious and perennial springs flow from the escarpments of this area where the base of the rock rests on the Oxford clay; and from these several villages have been supplied. The River Derwent, with a watershed of more than 40 square miles above Hackness, also helps to feed the underground supply by the inflow of water through fissures in the bed and banks of the river. Several villages, at the foot of the Wolds (which are composed of chalk), are supplied from a well and borehole, which yields a fine supply at a depth of 50 feet from the surface. The water in this borehole has never failed during the recent drought beyond the level of the water being lowered about 2 feet.

Main-Laying.

In connection with this branch of water-works management, I have discontinued the use of yarn in jointing pipes and adopted a strand of lead-tape instead. This saves much labour, and makes a very good joint with the run lead, besides doing away with a very offensive state of affairs caused by the decomposition of the yarn. I have taken records of the temperature of the ground at a depth of 3 feet below the surface for some years, and find it varies between 40° and 60° Fahr.; the actual readings being given in the following table:—

	1903.	1904.	1905.
January	43 to 41	43 to 41	41 to 40
February	41 ,, 43	41 ,, 40	40 ,, 41
March	43 ,, 44	40 ,, 42	41 ,, 42
April	44 ,, 44	42 ,, 46	42 ,, 45
May	44 ,, 48	46 ,, 51	45 ,, 51
June	48 ,, 53	51 ,, 54	51 ,, 57
July	53 ,, 55	54 ,, 60	57 ,, 60
August	55 ,, 54	60 ,, 58	60 ,, 59
September	54 ,, 53	58 ,, 56	59 ,, 56
October	53 ,, 50	56 ,, 51	56 ,, 48
November	50 ,, 45	51 ,, 45	48 ,, 44
December	45 ,, 42	45 ,, 41	44 ,, 43

In having the temperature of the ground taken, I had in view the question as to the proper depth to lay water-mains—firstly with regard to frost, and, secondly, as to increase of temperature in summer. After the considerations relative to traffic, it appears from the table that 3 feet cover will ensure safety from frost; but it is a question in my mind whether the increased temperature of the water by being conveyed a long distance in pipes insufficiently covered is not prejudicial. All water-pipes should be thoroughly coated before a particle of rust has been formed upon them. I believe Dr. Angus Smith's solution, if properly made and applied, will permanently protect pipes from corrosion, as evidenced by pipes taken up by myself after having been in the ground for 30 years.

Water-Works Finance.

From late decisions of Parliament and the Local Government Board, it appears that the number of years allowed for the repayment of capital is being considerably reduced from that previously granted. We seldom hear of 60 years being allowed, as was the case in the Scarborough Water Act of 1878. No doubt 60 years is too long for machinery—30 years being a nearer approximation to the average life of engines and pumping plant, which, though kept apparently as good as new, if properly looked after, will almost certainly be seriously inefficient, if not entirely out of date, before the end of that period. For reservoirs and mains, it has not been by any means proved that they will be obsolete and worn out even in 60 years; and it therefore appears to me that a more equitable adjustment of the term of years allowed for the various subdivisions of the works ought to be arrived at and consistently adhered to. Every water undertaking should have a depreciation fund, mantained by annual contributions from revenue, for meeting expenditure incurred by any accident to the works, engines, reservoirs, and mains

CONCRETE.

This is a subject of much interest at the present time, especially in view of the increasing use of "reinforced" concrete; and although we have had several discussions on it, I think there is room for more. No doubt members having such work in hand will be much pressed by the different firms to adopt their respective methods of construction. A paper giving some comparisons of strength and cost of the different systems would be most acceptable. The expansion and contraction of the concrete in a reservoir roof should also be dealt with.

FILTERS.

The filtration of water under varying conditions is one of the most interesting, as well as most onerous, questions which the water engineer has to solve. In one case he has to remove from the water, which from chemical analysis is apparently purity itself, invisible germs of vegetation or bacteria; in another, discoloration and impurities derived from peaty gathering grounds have to be eliminated; and in other cases, animal or mineral compounds in solution have to be removed. All this is being done in many places, almost to perfection, at the present time; the latest designs of mechanical filters giving excellent results, though it remains to be seen how they will stand the test of prolonged use. I hope a paper will shortly be forthcoming giving results of their efficiency and cost of working under various conditions.

PUMPING MACHINERY.

Pumping plant has reached such a degree of perfection in design, finish, and economy, that any new departure should receive special attention from members of this Association. The steam-turbine as a motive power for pumping machinery and the recent developments in high-lift centrifugal pumps and suction-gas plants are notable examples, and while a paper on the turbo-pump will be read at this meeting, papers on the high-lift centrifugal pump and suction-gas plant would be most acceptable.

Mr. C. H. PRIESTLEY (Cardiff) said he was sure it would give the whole of the members the greatest satisfaction in thanking the President for the able address he had delivered. In it, he had touched on many topics which were of special and general interest to them all. He had much pleasure in proposing a hearty vote of thanks to the President, and to ask him to allow the address he had read to be published in the Transactions.

Mr. H. ASHTON HILL (South Staffordshire Water-Works Company), in seconding, remarked that no further words were necessary to commend the resolution to the hearty reception of the members.

The proposition was unanimously adopted.

The PRESIDENT responded, and accorded the permission as to the publication of the address.

Scrutineers.

The PRESIDENT proposed, and it was agreed, that Mr. Albert Wells (Lewes), and Mr. George Watson (Westminster) be appointed to examine the balloting lists for members and associates.

Honorary Auditors.

Mr. Easton Devonshire (London) and Mr. S. Simmelkjör were elected Hon. Auditors for the current year.

New Members and Associates.

The PRESIDENT announced that the result of the examination of the balloting-lists showed that the following additions had been made to the roll of membership:—

Members.—Mr. H. G. Coventry, of Rothbury; Mr. E. Y. Harrison, of Wellingborough; Mr. T. W. Joyce, of Redruth; Mr. C. W. S. Oldham, of Ipswich; Mr. J. H. Taylor, of Barnsley; Mr. J. H. Webb, of King's Lynn.

Associates.—Mr. W. R. Baldwin-Wiseman, of Southampton; Mr. R. Chamberlain, of Otley; Mr. G. B. Hartfree, of Alton, Hants.; Mr. P. J. Jennings, of Port Elizabeth, S.A.; Mr. G. B. R. Pimm, of Exmouth; Mr. E. P. Richards, of Bamford; Mr. W. Shaw, of Brackley; Mr. L. M. Williams, of Matlock.

Papers and Discussions.

The papers (which will be dealt with in succeeding issues) were taken in the following order:—

Thursday.—"Rural Water Supplies," by Dr. J. MITCHELL WILSON, County Medical Officer of East Yorkshire. "Water Supply in a Dairy District," by Mr. WILLIAM PHELPS, of Wells, Somerset. These two papers were discussed together.

Friday.—"Tropical Waters and their Purification," by Mr. H. G. FOSTER-BARHAM, Assoc.M.Inst.C.E., F.G.S. (Read by the Secretary, Mr. Percy Griffith, in the absence of the author.) "The Geology of North-East Yorkshire in Relation to the Water Supply of the District," by Mr. C. FOX-STRANGWAYS, F.G.S. "The Parsons Turbine," by Mr. F. G. HOLDEN, B.A., Assoc.M.Inst.C.E., Resident Electrical Engineer of Scarborough.

Saturday.—"The Laying of a Submerged Water-Main under the River Ouse," by Mr. W. H. HUMPHREYS, of York.

At the conclusion of the discussion on the last-mentioned paper,

The PRESIDENT said he was sorry they were not permitted by time to have the paper read by Mr. Ralph Blakiston, on "Various Causes of Waste of Water, and Methods of Prevention;" and therefore it must remain for reading at the winter meeting. He was happy to say that several papers were already promised for that meeting; and he hoped as many members as possible would be present—at any rate, more than usual—to discuss them.

Votes of Thanks.

Mr. H. ASHTON HILL (South Staffordshire Water-Works Company) said it was his pleasure to propose a very hearty vote of thanks to the Mayor and Corporation of Scarborough first of all for their reception. The members all knew how much the success of a gathering of this sort depended upon the manner in which they were received; and they had, indeed, every reason to be gratified with the way the Association had been welcomed to Scarborough. This bore testimony to the popularity of the President, whom they were very pleased to find so well supported by the Corporation. Then, again, the members had to thank the Mayor and Corporation for their hospitality on Thursday, when visiting the pumping-stations. Fortunately the day was fine; and the tea was a very nice interlude in their afternoon's proceedings. They had also to thank the Mayor and Corporation for the use of the Town Hall, for the transaction of the more serious part of their proceedngs.

Mr. C. H. PRIESTLEY (Cardiff), in seconding the motion, remarked that he did not think there was any place the Association had visited during the past ten or eleven years where they had been on a more friendly footing with the municipal authorities than they had been at this meeting in Scarborough; and he thought that the President was to be heartily congratulated on the success of the meeting.

The proposition was cordially passed.

Mr. C. SAINTY (Windsor) said he had to propose a hearty vote of thanks to the authors of the various papers, to which they had listened during the three days. They had, in the first place, to thank their President for the excellent description he had prepared of the Scarborough Water-Works. The paper on the geology of the district around by Mr. Fox-Strangways was a splendid one; and Dr. Mitchell Wilson's paper was very instructive not only to the members but to the residents in the town and neighbourhood. Mr. Phelps's paper was also an excellent one; while that by Mr. Foster-Barham, late Engineer to the Brisbane Water-Works, would be a very useful addition to their Transactions. Mr. Holden had to be thanked not only for his communication on the steam-turbine, but also for showing them, at the electricity works the previous afternoon, one of the turbines open. In this he was sure all the members were much interested. In his own case, it was the first time he had seen the inside of a steam-turbine. Mr. Humphrey's paper was also interesting and useful.

Mr. A. B. E. BLACKBURN (Sunderland), in seconding the motion, remarked that the members owed a debt of gratitude to the authors of the papers, who must have been put to considerable trouble in preparing so much valuable information. Especially did they value such papers as that by Mr. Humphreys, giving details of actual experience. He did not think that even the youngest of the members present need be afraid of supplying in papers such details as Mr. Humphreys had done. Papers of this stamp they greatly valued; they produced plentiful and practical discussion.

The PRESIDENT added his personal thanks to the authors of the papers.

The motion was unanimously carried.

Mr. WILLIAM TERREY (Sheffield) moved a vote of thanks to the Council and officers for their services during the past year. A vast amount of time and labour, he said, was expended by the Council and the Committees in conducting the affairs of the Association. He had himself had, in the earlier years, the honour of being a member of the Council;

and he knew something of the time that the members had to devote to the affairs of the Association.

Mr. F. W. Hodson (Loughborough), in seconding, said the members had an example, in the magnificent meeting they had had, of the hard and good work the Council had performed. The labours of the past year had been rather heavier than usual, in that the Council had been dealing with the question of the revision of the rules as well as with the ordinary routine business of the Association.

The motion was cordially agreed to.

Mr. G. Greenslade (South Hants Water-Works Company) replied for the Council and officers. He observed that the work of the Council was very considerable at times. Several of the members had to travel many miles to attend the Council meetings; and they did it with a great deal of pleasure. Their work had on this occasion been considerably lightened by meeting in such a beautiful town as Scarborough, and by the valuable assistance rendered by their President.

Mr. R. H. Wyrill (Swansea) proposed a vote of thanks to the President for the arrangements made for the meeting, and for his services in the chair. The meeting had given him (Mr. Wyrill) an opportunity of renewing his acquaintance with the Scarborough Water-Works. He knew them well, perhaps now more than 25 years ago, before he went south, for he was then an Assistant Engineer under Mr. Filliter. He was sure they were all deeply grateful to the President for the admirable arrangements he had made.

Mr. W. Phelps, in seconding, said that among the incidents he had observed at the meeting had been the way in which the President had tried to bring out the young members. Another thing was that, without any bustle, they had, through the direction of the President, got through an enormous amount of work. Apart from the matters already referred to by the proposer, they appreciated very much the great kindness of Mr. and Mrs. Millhouse in entertaining them at the Irton pumping-station the previous day.

Mr. Percy Griffith asked to be allowed to discharge a commission entrusted to him by the ladies. They had had a large number of ladies with them on this occasion; and they wished to join in thanking the President and Mrs. Millhouse for the kindness and thoughtfulness extended to them. They indeed greatly appreciated all that had been done for their comfort and happiness.

The resolution was carried with great enthusiasm.

The President, in his acknowledgment, said this was the second great difficulty he had had to face during this meeting. The arrangements were really nothing in comparison, as they were spread over several months. The way in which the members had expressed their satisfaction with all that had been arranged was ample thanks for him. He himself was delighted with everything, and especially that the members had enjoyed the meeting so thoroughly. He must, not, however, take all the glory for the arrangements. Their Secretary had performed the major part. He had seconded Mr. Griffith to the best of his ability; and he (the President) had been seconded and aided by his wife, who had been most enthusiastic in the matter. With regard to the proposer of this vote, he should like to say that he (the President) and Mr. Wyrill had been connected now for a great number of years. It was considerably more than thirty years ago that they were both of them engaged on the Leeds Water-Works.

This terminated the ordinary business proceedings.

Revision of the Rules.

A Special General Meeting of the members was then held to consider the revised draft of rules submitted by the Council; and they were adopted without a single dissentient.

VISITS TO THE WATER-WORKS AND THE ELECTRICITY STATION.

Scarborough and its beautiful environment are at all times attractive; and when Old Sol is at his best, the town and Nature's grand framework are fascinating. It was under perfect atmospherical conditions that, on Thursday and Friday afternoon, the members, accompanied by their lady friends, made excursions, by brakes, into the charms of the surrounding country.

On Wednesday afternoon, they visited Oliver's Mount covered service reservoirs, and the Osgodby and Cayton Bay pumping-stations. At these places and *en route* they enjoyed some lovely scenery. What was seen at the works need not be described. Information appears in succinct form in the description of the works prepared by the President, as given on pp. 178-81. At Osgodby reservoir, a great deal of interest was taken by the members in the method the President had adopted—the use of a weak solution of copper sulphate—for obtaining relief from the considerable trouble caused by the growth of algae and diatoms. The process is described in the President's description of the works. In addition to the information there given, it may be mentioned that the reservoir was treated again in the spring; and it is hoped that it will go through the summer and winter without giving trouble.

At Cayton Bay pumping-station, there was an individual reception by the Mayor and Mayoress, who also very kindly provided a welcome and refreshing *al fresco* tea. Before leaving, his Worship and Mrs. Hastings Fowler were, on the motion of Mr. Palmer, seconded by Mr. Priestley, heartily thanked for their hospitality—the resolution being carried by applause, in which the ladies generously joined. The Mayor made a cheerful response which delighted the visitors—expressing, too, his pleasure that the weather had favoured their schemes, and had not produced a ghastly failure.

A Surprise Presentation—President's Silver Wedding.

If the scenery was lovely through which the visitors passed on Thursday afternoon, that which met their eyes after quitting the town on Friday, must be described as magnificent. They first of all visited the electricity works; and there Mr. F. G. Holden, the Engineer, had one of the Parsons turbines used at this station open for the inspection of the members, who were extremely interested in it. The journey was continued to the Irton pumping-station, where, after an inspection had been made of the machinery, the visitors disported themselves in the pretty grounds surrounding the engine-house.

Here there was a long-to-be-remembered happy incident. It had come to the knowledge of certain of the leading spirits in the Association, through an intimate friend of the President, that the day previous marked the silver wedding of Mr. and Mrs. Millhouse. But the President himself had given no inkling of this auspicious occasion in his domestic life, and had attended to his presidential duties with an assiduity that, under the exceptional circumstances, showed extraordinary human virtue. The opportunity was too good to be missed for making a surprise presentation to Mr. and Mrs. Millhouse; and privately the members at the meeting equally subscribed, and purchased a handsome pair of silver gravy boats, with case, to which a silver plate is affixed bearing the following inscription:

British Association of Water-Works Engineers.

Annual Meeting, Scarborough, July, 12, 1906.

Presented to the President, William Millhouse, Esq., Assoc.M.Inst.C.E., and Mrs. Millhouse, by the Members at the Meeting, as a token of their Regard and Esteem; the above being the date of their Silver Wedding.

There was genuine amazement on the faces of both the President and his genial wife when their visitors collected at the foot of the high steps leading to the engine-house, and invited them into the great circle. Addressing Mr. and Mrs. Millhouse,

Mr. P. H. Palmer (Hastings) said: Mr. and Mrs. Millhouse—It came to the knowledge of the members of the Association yesterday that it was your silver wedding day; and they thought it would be appropriate to make some little presentation to you to mark the event. A Committee (if I may so term it), composed of a few ladies and gentlemen, have purchased a little present which they hope will be acceptable to you; and it is presented to you with the best wishes and good fellowship of the whole of the Association. The meeting here has been a pleasurable one in every sense of the word; and we shall all recollect it, not only for the meeting itself, but because it marks this important event in your lives.

The Mayor (invited by Mr. Palmer to say a few words) said: It is difficult for me to speak, as this is really an Association gift; but I can endorse all the Ex-President has said. The completion of twenty-five years of married life and a silver wedding—although I have not come myself to that yet—do constitute an important event in one's life. Mr. Millhouse has been with us in Scarborough for many years; and, as I have already said in the Council Chamber, both the Corporation and the town respect and esteem him. I am glad indeed to have been at the presentation of this little gift. The best wish I can think of is, that in due course Mr. and Mrs. Millhouse may celebrate their golden wedding under equally propitious circumstances.

Mr. Millhouse (who was received with cheers) said in reply: On behalf of my wife and myself, I can only say that this is all so unexpected that you must not expect me to say many words, other than to express

my sincere thanks to you for your great kindness. This meeting, both in its anticipation and its realization, has been a great pleasure to me; and that pleasure is to-day considerably intensified. Your good will to me is beyond any adequate expression on my part. I cannot express my feelings as to what you have said concerning my wife and myself. To my wife, it has given the greatest pleasure to meet you here to-day. If we reach our golden wedding—it is a long way off—we hope that we shall see you here again then.

After this in a large marquee, the President and Mrs. Millhouse entertained the members to tea; and a very enjoyable hour was spent here and in the grounds. Remounting the brakes, the visitors were driven through the notoriously picturesque Forge Valley, and had the pleasure of walking through the beautiful gardens of Hackness Hall, the seat of Lord Derwent. It was a long drive; but the ever-changing panorama of exquisite scenery kept at bay the weariness that might otherwise have been felt.

On Saturday afternoon, the visitors were privileged to make an inspection of the new Marine Drive, upon which the town has already spent about £100,000. Truly described as "one of the most notable marine engineering works of the generation," it opens up the whole of the sea-front, and gives a fine promenade close to the sea.

THE ANNUAL DINNER—BROADENING THE BASIS OF THE ASSOCIATION.

On Friday evening, the Annual Dinner was held in the Ball Room at the Grand Hotel, where most of the visitors were staying. The PRESIDENT was in the chair, and had on his right and left respectively were the Mayor and the Chairman of the Water Committee. Several other members of the Corporation and colleagues of Mr. Millhouse were present. After dinner there were a few toasts, which were interspersed by songs and quartettes. After the loyal toasts,

Mr. C. SAINTY proposed "The Mayor and Corporation of Scarborough." He commented on the historical and beauty fame of the town. The meeting of the Association, he also remarked, had been a great success; and for this they were largely indebted to the kindness of the Mayor and Corporation, whose generosity had been so great. Those present desired for Scarborough a progressive success.

The MAYOR responded. He again referred to the President's long connection with the Corporation Water Department, to the confidence of the Corporation in him, and to the esteem entertained for him by the town generally. From his own personal knowledge of Mr. Millhouse, he could say that on no shoulders could the honour of the presidency of the Association more worthily have fallen. He coupled with the congratulations of the town to Mr. Millhouse on his elevation to the presidency, their congratulations on his silver wedding, together with an expression of the hope that, under equally happy conditions, he might be spared to celebrate his golden wedding. Turning to the toast, he spoke of the misconception of some people as to the duties of corporate bodies. His own judgment was that mayors and corporations were those who did a great deal of hard work, and received scant thanks for it. As a corporation, they were glad to welcome the Association, because there was no body of gentlemen who performed more valuable duties, and who, speaking from the point of view of Scarborough, had to guard one of the most important factors in the success of any health resort. In conclusion, he thanked the members for their good wishes.

Alderman VALENTINE FOWLER, the Chairman of the Corporation Water Committee, gave "The British Association of Water-Works Engineers." He reiterated the good wishes and congratulations to the President; and then, referring to the work of the Association, he said that one of the vital necessities of any community rested in the hands of the members. It was essential that every town should have an unfailing supply of pure water; and this he believed Scarborough had at their disposal. However, at some not very distant date, they would have to make further outlay on the undertaking, to meet the growing demand; but this he was sure no one would regret. The Corporation were lucky in having Mr. Millhouse as their Water Engineer; and all hoped he would remain in Scarborough to the end of the chapter.

Alderman LAND, in also speaking to the toast, was reminiscent, giving of his recollections anterior to, and succeeding, the purchase of the water-works by the Corporation, and of the appointment of Mr. Millhouse as Water Engineer. Excellent work had been done by Mr. Millhouse in the town. He (Alderman Land) could speak with some authority, as he had been connected with the Corporation for some 32 years, and for 28 years had been a member of the Water Committee. He hoped the Association would increase in prosperity.

The PRESIDENT, in rising to respond, was greeted with cheers. In the name of the Association, he heartily thanked the Mayor, the proposer and seconder, and the visitors present, for the way in which they had received the toast. The duties which the members had to perform in their official capacities were, he observed, most onerous and responsible. In all towns, and especially in a place like Scarborough, everything must be as near perfection as it was possible to make it, and the water supply particularly must be perfect in its purity. He spoke of the objects of the Association, and remarked upon the difficulty there had been in getting regulations passed by the Local Government Board. Water authorities ought, in his opinion, to have more control in connection with water-fittings, and the regulation of the conditions under which water supply is provided. He hoped that something really valuable would ensue from the work of the Joint Committee to which he had made reference in his Inaugural Address. He again alluded with gratification to the incident which marked the afternoon; and in his concluding words mentioned that his Chairman and Alderman Land were the only gentlemen now serving on the Town Council who were members when he was appointed as the Borough Water Engineer, some 27 years ago.

Mr. C. F. GETTINGS (Teignmouth) proposed "The Council and Officers." The excellent work of the President, Past-Presidents, and Vice-Presidents, together with that of the other members of the Council, was brought under review; and, in regard to the officers, he pointed out that the members one and all recognized in Mr. Percy Griffith an indefatigable Secretary, who endeavoured to please them all.

Mr. J. S. PICKERING (Cheltenham) acknowledged the toast on behalf of the Council. He remarked that it was almost incredible that eleven years ago, there was no Association in existence for the technical good of water engineers. But the eleven years the Association had been in existence had been a period of great progress. At the present time, they had on their roll between 300 and 400 members and associates; and he believed they now included in their membership the whole of the principal water engineers of the country, as well as those engineers who were engaged in the manufacture of engines and fittings. By their unity in this way, they were able to gain some very valuable information, for the benefit not of themselves only, but of the authorities and communities they served. The Council had always been imbued with the necessity of raising the standard of the water engineer; and they desired that the profession should rank among the noblest professions in the land. At a special meeting the next day [Saturday], the name of the Association would no doubt be changed to "The Association of Water-Works Engineers," as the present title did not appear to be sufficiently comprehensive—their membership now embracing, as it did, engineers throughout the world, and not only those of the Empire of Great Britain.

Mr. EASTON DEVONSHIRE (one of the Honorary Auditors) responded on behalf of the officers. Having referred to the work of Mr. Griffith, he said that he was pleased to say the finances of the Association were in a satisfactory condition. In the report of the Honorary Auditors, they had made certain suggestions, one of which was that the Council might now consider the advisability of using some of the surplus funds for the payment of premiums for papers, some of which merited that distinction. Thanks to the energy of their Secretary, what had previously been a loss on their "Transactions" would, it was now believed, be altogether obviated. If they could counterbalance that loss, they would come out of the year with a nice balance, which should be used for the benefit of the Association. He also suggested for the consideration of the Council that chairmen and members of Water Committees and Boards of Water Companies should be admitted as associates in Class "B." As a representative of Water Companies, he would do his utmost to induce his fellow-Directors to become Associates. His opinion was that the chairmen and members of committees and boards had a lot to learn, and they would be much benefited by attending meetings such as the Association were now holding. He also suggested that arrangements should be made for another foreign trip. They had what he believed on all hands had been conceded to have been a very satisfactory one two years ago; and if they could now arrange to go to France, while the *entente cordiale* was still warm, the members he knew would be most cordially received. There was a great deal to be seen in connection with the water supply of Paris. If the members agreed to go to France, both Dr. Kemna and himself would do all they could in furthering the arrangements.

Mr. H. ASHTON HILL, in happy terms, proposed "The Visitors," to which Mr. Councillor M. T. Whittaker replied in a very witty speech.

SCARBOROUGH CORPORATION WATER-WORKS.

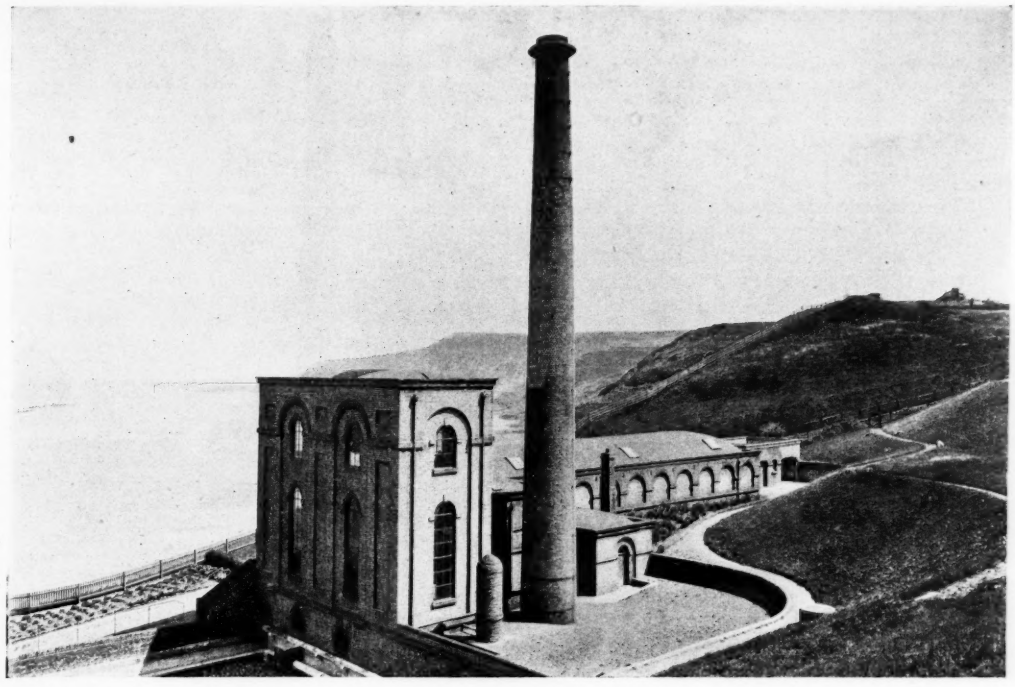
By WILLIAM MILLHOUSE, Assoc.M.Inst.C.E.,

Corporation Water Engineer and President of the British Association of Water-Works Engineers.

The Scarborough Water-Works date from the year 1845, when a Company was formed and parliamentary powers were obtained to construct the pumping-station at Cayton Bay. It was, however, contemplated in the first instance to obtain water from the Wold Hills near Folkton and Staxton; but an opportunity occurring of purchasing the Cayton Mill and Spring, the Directors availed themselves of the advantages this site offered.

The works at Cayton Bay were constructed from the designs of the late Mr. Thomas Wicksteed, C.E., of London; and the first Cornish engine, capable of pumping 400,000 gallons per day, was erected. This engine has since been taken down. In 1853, the larger engine now in existence, capable of pumping 720,000 gallons per day, was erected. This is still doing good work as a reserve. The supply from the springs at Cayton Bay is derived from the limestones and calcareous grit of the coralline oolite, where the water is held up by a fault having brought the Oxford clay against the limestones and calcareous grit, and thus formed an underground reservoir. The yield from this source averages a million gallons per day, and is of excellent quality, bright, and sparkling. During the late very dry seasons, the daily yield has not fallen below 650,000 gallons. This water is pumped either to the Osgodby reservoir or to the town as desired.

In 1872, the town having increased to such an extent that the Cayton Bay Pumping-Station was insufficient to supply the demand, a well was sunk and pumping plant erected at

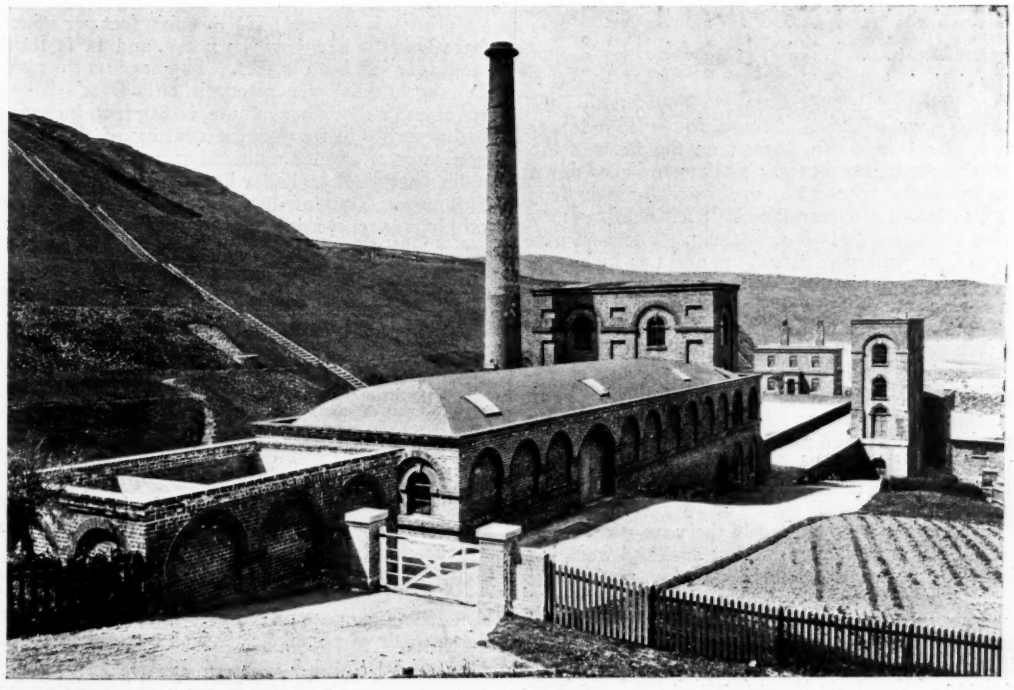


The Cayton Bay Pumping Station of the Scarborough Corporation Water-Works.

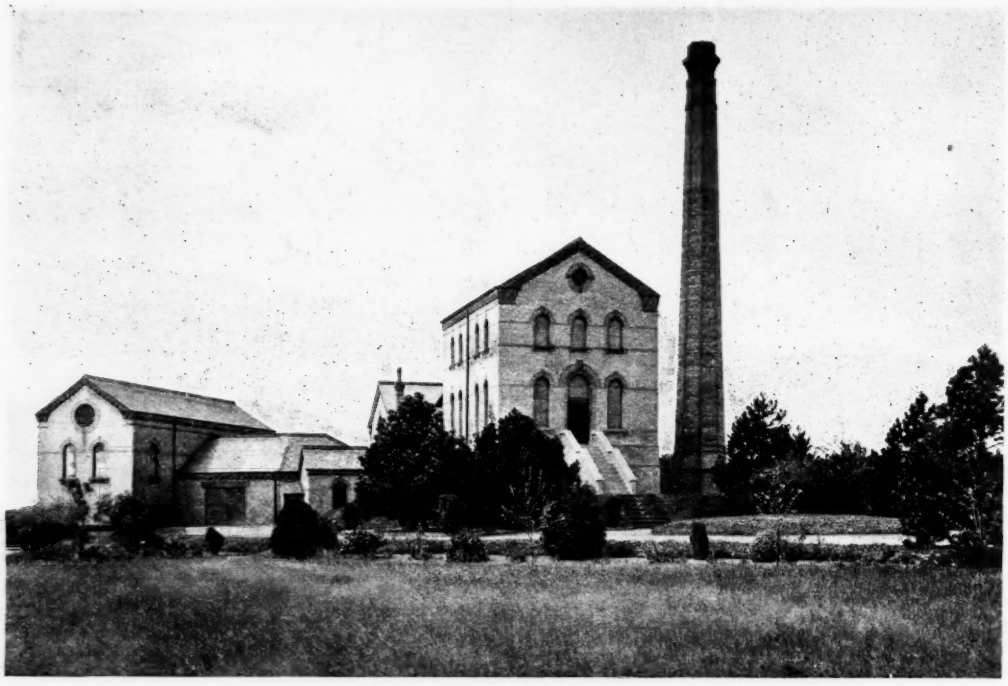
Osgodby, for pumping water from the same strata as at Cayton Bay—a mile further inland. The area supplying this well with water is that lying between the works and Oliver's Mount on the north, the coast on the east, and probably as far as the North Eastern Railway on the west. The well at Osgodby is 10 feet in diameter, sunk 100 feet into the limestone and calcareous grit, with headings driven from the bottom. There is generally more water in this well than the engine can pump, the yield varying from a minimum of 600,000 gallons a day to over 900,000 gallons per day, which is the capacity of the pumps. The engine at the Osgodby works is of the Cornish Bull type, placed directly over the well, and capable of raising 680 gallons per minute through a 12-inch main one mile long to the Osgodby reservoir. The total lift, including friction, is 225 feet. Steam is supplied by two Lancashire boilers working at 40 lbs. pressure, and the consumption of small pea coal is about 5½ lbs. per horse power per hour.* Although the Cayton Bay and Osgodby Pumping-Stations draw their water from the same strata, the pumping at Osgodby does not cause any diminution in the supply from the springs at Cayton Bay, so far as can be noted by careful gauging both when the Osgodby engine is working and when it is standing idle.

In 1878, the Company, again finding their works insufficient for the growing needs of the town, promoted a Bill in Parliament for power to construct reservoirs and impound the water of the Jugger Howe Beck, situated on the moors to the north of Scarborough. The Corporation, however, had a Bill in the same session of Parliament under which

* The cost of Yorkshire pea nuts averages 14s. 6d. per ton on to the works at Cayton Bay and Osgodby, and 12s. 6d. per ton on to the siding at the Irton Pumping-Station.



Another View of the Cayton Bay Pumping Station.



The Irton Pumping Station of the Scarborough Corporation Water-Works.

they ultimately purchased the water undertaking from the Company. The Corporation, instead of impounding the Jugger Howe water as proposed by the Company (this water having a solvent action on lead), went further inland, and put down a well at Irton, into the strata which supplies the old pumping stations at Cayton Bay and Osgodby. The dimensions of the well and borehole, and the sequence and thickness of the strata, are as follows:—

Well and Boring at Irton.

Construction.	Ft.	In.		Total Depth of Bore. Ft.	In.
10-feet cylinders	70	0	..	70	0
24-inch tubes	28	0	..	98	0
20-inch open boring	152	0	..	250	0
12-inch ,, ,,	178	0	..	428	0

Strata.

	Thickness. Ft.	In.		Total Depth. Ft.	In.
Boulder clay, gravel, and sand	53	6	..	53	6
Kimeridge clay	45	0	..	98	6
Upper calcareous grit	46	0	..	144	6
Upper and lower limestones	120	6	..	265	0
Lower calcareous grit	135	0	..	400	0
Oxford clay	28	0	..	428	0

The 10-feet cylinders, which were got down with considerable difficulty, were formed of rings, 10 feet in external diameter and 5 feet in depth, turned on the faces of the joints and strongly bolted together. They were forced down from the surface as the ground was excavated through drift and boulder clay into the Kimeridge clay; a load of 130 tons weight having to be applied to sink them. The cast-iron bottom plates of the well were closed up, and a 24-inch cast-iron tube driven from the bottom of the well to the top of the rock; a copious supply of water, which rose to the surface, being obtained directly the rock was reached. The boring was then continued through the calcareous grits and limestones until the Oxford clay was reached, and a permanent supply of a million gallons per day obtained. With a view to further extensions at this station, the yield from the well has been tested, and a supply of 2½ million gallons obtained at a depth of 17 feet below the surface. At present, when pumping 1¼ million gallons per day or thereabouts, the water in the well stands at 6 feet below the surface. These works were opened in the year 1884.

To the south of the well, and running east and west, is a fault, which has thrown the Kimeridge clay against the lime-stones and calcareous grits, and so formed an underground reservoir, which is also fed by the River Derwent, where it crosses the outcrop of the limestones, &c., in Forge Valley. The face of the cliff in the White Quarry reveals a good specimen of the strata through which the Irton borehole was sunk.

The following data, showing the rate of which the water rises in the well at different depths, may be of some interest. The top of the well is 96 feet above Ordnance Datum. The test commenced 21 feet below surface, or 75 feet above Ordnance Datum.

	Gallons per Minute.	Gallons per Day.
At 76 feet water rose 1 foot in 28 seconds		
,, 77 ,, ,, ,, 27 ,,	(average) 1,950	2,808,000
,, 78 ,, ,, ,, 29 ,,		
,, 79 ,, ,, ,, 29 ,,		
,, 80 ,, ,, ,, 33 ,,	(average) 1,800	2,690,000
,, 81 ,, ,, ,, 37 ,,		
,, 82 ,, ,, ,, 38 ,,		
,, 83 ,, ,, ,, 47 ,,	(average) 1,548	2,229,000
,, 84 ,, ,, ,, 55 ,,		
,, 85 ,, ,, ,, 62 ,,	1,410	2,030,000
,, 90 ,, Ordinary pumping for supply	936	1,347,000
,, 79 ,, Special 10 days' continuous pumping test		2,500,000

The water was measured over a gauge 18 inches wide, and readings were taken every 15 minutes, calculated on Francis' formula—viz.,

$$200\,(L - 0{\cdot}2\,H)\,H^{\frac{3}{2}} = \text{cubic feet per minute,}$$

where L is the length of the notch, and H is the height of water over sill, both in feet. The head on the pumps, when pumping to the lower reservoir on Oliver's Mount at the rate of 936 gallons per minute, is 315 feet, including 66 feet head absorbed in friction, the velocity of the water through 5700 yards of 13-inch main being 2·72 feet per second. The engines are single-cylinder beam-engines, with high and low lift pumps. The low-lift pumps, which are of the bucket-and-plunger type, raise the water from the well into the condenser tanks, from which the high-lift pumps deliver it to the reservoirs at Scarborough. The following are the principal dimensions, &c., of the pumping machinery:—

Diameter of cylinders	26 inches.	
Length of stroke	7 feet.	
Diameter of force pumps	11 inches.	
Length of stroke	3 ft. 6 in.	
Capacity of pump	28 gallons.	
Delivery of pump	26½ ,,	or 95 per cent.
Revolutions per minute	18	
Coal per 1 h.-p. per hour	4 lb.	

Reservoirs.

Of the three reservoirs connected with the supply, No. 1 is a high-level service reservoir, having a capacity of 1½ million gallons, and is situated in the top of Oliver's Mount, 505 feet above Ordnance Datum. It is lined with brick laid on concrete, and made water-tight with clay puddle. It was constructed as an open reservoir; but trouble having arisen from the growth of algae, &c., it was covered in by the author, 15 years ago, with a concrete roof resting on brick pillars 18 inches square, 12 feet apart, with rolled steel joists laid in parallel lines on the pillars. The joists are embedded in the

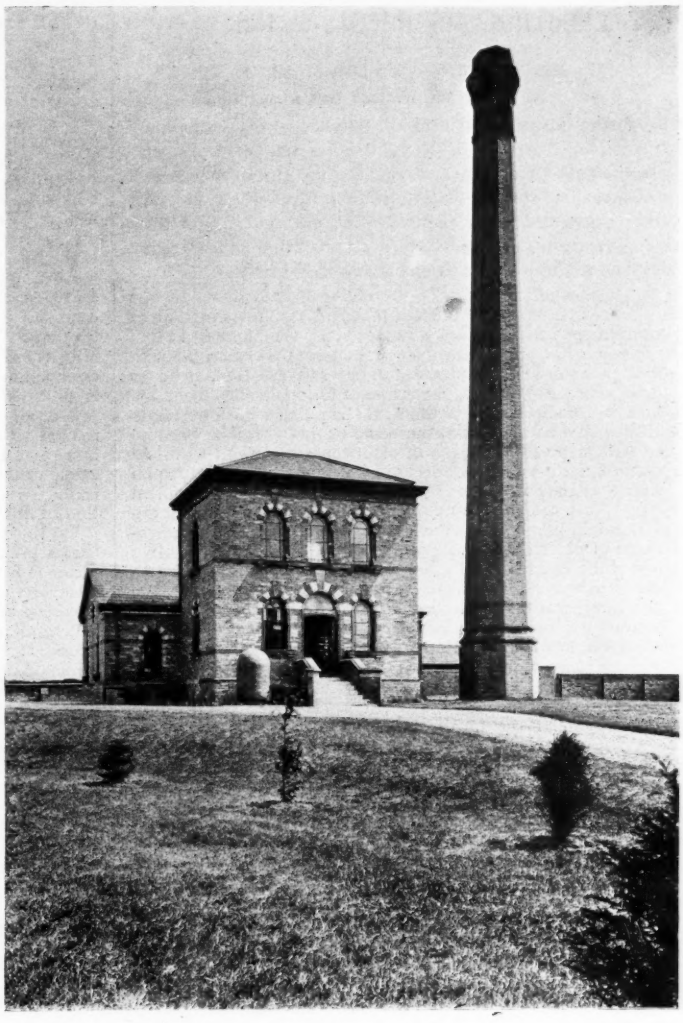
concrete, and the concrete is slightly arched from joist to joist; the minimum thickness at the crown of the arch being 7 inches. The concrete is coated with asphalte, and finally with broken stone and gravel. The area of the roof is 2582 square yards. The cost, including pillars and foundations, was £2000.

No. 2 is a covered service reservoir, also situated on Oliver's Mount, built of brick, with clay puddle as a water-tight medium. The roof is formed of brick arches built on cast-iron girders carried by brick pillars 18 inches square. The depth of the water in this reservoir when full is 17 feet, and the capacity 1½ million gallons. The top water level is 338 feet above Ordnance Datum. The pillars rest on inverted groined arches, bedded on lias lime concrete, resting on clay puddle.

No. 3 is an open reservoir at Osgodby Hill, about 2 miles from Scarborough, and 337 feet above Ordnance Datum, with a capacity of 4½ million gallons. The water stored in this reservoir gives considerable trouble from the growth of algae and diatoms, and has been practically useless in the summer months. During the past year, a trial was made of copper sulphate. The bottom of the reservoir was covered with a weak solution, 1 in 1,000,000 of the sulphate, and left for a day or two. It was then emptied out, and the reservoir flushed with clean water before it was refilled. For the remainder of the summer, the water was perfectly free from all vegetation, algae, &c. All the reservoirs are connected with each other; and the mains are so arranged that all the engines can pump into any of the reservoirs as required.

The largest daily consumption is in August, when it amounts to 2 million gallons, supplying a population of 40,350 residents in the borough; 1464 residents in outlying villages; and 20,000 visitors—total, 61,814 not including excursionists.

The following analyses of the several waters supplied to Scarborough may be of interest to the members for comparison with other limestone supplies.



The Osgodby Pumping Station of the Scarborough Corporation Water-Works.

Analyses.

	Cayton.	Osgodby.	Irton.
		Grains per Gallon.	
Total solid residue	22·14	22·00	14·87
Chlorine	3·80	2·20	1·60
Nitrogen as nitrates	—	0·335	—
Oxygen absorbed in 2 minutes	—	—	0·013
Oxygen absorbed in 4 hours	—	0·033	0·027
		Parts per Million.	
Free ammonia	—	0·0064	0·0186
Albuminoid ammonia	0·02	0·005	0·039
		Degrees, Clark.	
Temporary hardness	11·00	11·20	10·50
Permanent ,,	5·00	5·00	1·50
Total hardness	16·00	16·20	12·00

Analyses of Solid Residue.

	Cayton.	Osgodby.	Irton.
		Grains per Gallon.	
Silica	0·35	0·56	0·28
Oxide of iron and alumina	0·19	0·36	0·40
Carbonate of lime	10·43	8·27	9·16
Sulphate of lime	2·94	3·41	1·64
Nitrate of lime	—	1·96	—
Carbonate of magnesia	3·22	2·58	0·75
Chloride of sodium	3·85	3·62	2·64
Sulphate of sodium	0·32	—	—
Minor constituents and loss	0·84	1·24	—
	22·14	22·00	14 87

The temperature of the water in the Irton Well never varies from 50° Fahr.

The four accompanying photographs have been specially taken for the author (by Mr. A. E. Cuttle, of Scarborough) to illustrate this paper.

The Decimal System.

In a pamphlet bearing the title of "Decimal Coinage, Weights, and Measures," which is published by Messrs. George Routledge and Sons, Limited, Mr. Edwyn Anthony, M.A., the Chairman of the Weights and Measures Committee of the Herefordshire County Council, discusses the question of the advisability of the decimal system being introduced in this country. He first considers the question of coinage, and comes to the conclusion that "the adoption of a decimal system which alters the value of the penny is almost outside the sphere of practical politics." As to weights and measures, he points out that a change to the metric system would entail the destruction of our existing standards. This difficulty, which has received little attention from the advocates of that system, Mr. Anthony regards as the most weighty of all. Its recognition by Sir H. Jekyll led him to exempt the measurement of gas from the operation of the system, in the event of its being introduced. The conclusion come to by the author is that the time has not arrived for legislative interference with our weights and measures; but he thinks that by adopting the decimal reckoning of money we should bring ourselves into line with the rest of the world. This subject, however, on its practical side is so difficult, far-reaching, and important, that he considers the Government alone can satisfactorily deal with it; and he suggests the institution of systematic inquiry into the whole matter.

Mond Gas in Germany.—The German Mond Gas and Bye-Products Company is the title of an undertaking which has just been formed at Sodingen, Westphalia, with an ordinary share capital of £50,000. The object is to work the Mond gas and incidental processes, and to establish in Germany works and plant for these purposes. Apparently the Mont Cenis Zewerkschaft, of Sodingen, already possesses the rights in these respects as granted by Dr. Ludwig Mond and the Power Gas Corporation, Limited, of London; and these are brought into the new Company by the Mont Cenis works, which are represented as being interested to the extent of £10,000.

ELECTROLYSIS OF GAS-MAINS.

By Mr. M. R. Bump, of Denver (Col.).

[A Paper read before the Western Gas Association.]

In preparing this paper on a subject that has been so extensively and exhaustively discussed before all the Gas and Water Associations for the past fifteen years, it has been my aim to reduce to a compact form the various views on the subject which are now accepted by gas and water engineers. In addition, I have tried to set forth certain facts which, to my knowledge at least, have not received the attention and discussion they merit.

On the fundamental theory of the electrolytic cell, much has already been written. The present theory is the development of a hypothesis set forth by Clausius in 1857. When a salt is dissolved in water and the slightest electric current is passed through the solution, some of the molecules of the salt are broken up to form ions, which are atoms, or groups of atoms, which form the basic and acid components of the salt. If an electric current is passed through a salt solution, the basic or metallic ions become charged with a positive charge of electricity, and tend to move towards the negative electrode and discharge their electricity upon it. As soon as they are discharged, the ions become free chemical atoms, and plate themselves upon the electrode as a metallic deposit. The acid ions in the solution become charged with a negative charge of electricity, and tend to move toward the positive electrode of the cell and to discharge upon it. When discharged, they likewise become chemically free and active; and if the electrode is a metal that forms a salt with the acid ions thus freed, the electrode will be broken down to form that salt, and will thus be carried off into the solution. It is this latter reaction that usually takes place when an iron pipe is corroded and destroyed by the acid ions in the earth surrounding the pipe.

The correctness of the theory of electrolytic action has recently been challenged by Dr. Louis Kahlenberg, who has gone very extensively into the chemistry of the subject, and who presents a long list of arguments, based on experiment, that apparently disprove the theory. This makes little difference to the gas man; for with the laws worked out he can calculate the effect of the action, and this is the point that he is interested in.

There are two general laws which govern the amount of electrolytic action; and with these laws the effect can be determined for any particular case: (1) When an electric current is passed through an electrolyte, the quantity of the liquid decomposed—*e.g.*, the amount of electrolytic action—depends upon the amount of electricity, measured in coulombs, which passes through the electrolyte, and is independent of the size of the electrode and of the electric pressure applied. (2) When equal quantities of electricity are passed through different electrolytes, equivalent quantities of them are decomposed—*e.g.*, a coulomb of electricity will decompose a certain amount of a chloride solution, and a different but equivalent amount of a sulphate solution; and these amounts always bear a definite relation to each other.

The first law states that the amount of electrolytic action is independent of the pressure applied. This is where many mistakes have been made by gas men who have expected to find the greatest electrolytic action where the voltmeter showed the greatest reading between the rail and the pipe. The customary pressure charts of our cities have for this and other reasons very little value except to define the bounds of the so-called "negative" area. The fact that the drop from the pipe to the rail is large, indicates that the earth at that point is a very poor conductor of electricity, and that the current flow between the two is small. Often the greatest amount of corrosion is found at points where the difference of potential is almost too small to determine—being only one or two milli-volts. The first law also makes it plain that one ampère of current flowing from a pipe will destroy a certain definite amount of iron, whether the pipe is 2 inches or 60 inches in diameter, providing it is in the same quality of earth.

The second law relating to quantities decomposed is stated in the reverse manner from that desired for the use of gas men. A given quantity of electricity will decompose a certain amount of iron, if ferric or the higher salts are formed, and another definite amount if ferrous salts are formed, regardless of whether the electrolyte is a chloride, sulphate, or any other acid. Metals like iron, that form two series of salts, possess this quality. For others that form only one series of salts, there is always but one quantity decomposed by a given amount of electricity.

It has been generally supposed and accepted that damage to a pipe occurs only where current leaves the pipe; and in general this statement is practically correct. I am informed by Professor Burgess that it has been proved that in some cases current entering a pipe has caused an acceleration of the corroding action on the pipe. An explanation of this action may be found in the fact that pipes subject to the natural corroding influence of the surrounding earth become covered with a deposit that protects them from further corrosion. When a current enters the pipe, it may destroy the covering thus formed, and leave the pipe subject to further corrosion from the surrounding earths.

We are all familiar with the attempts made during past years to induce or force traction companies to adopt better return construction. First, better bonding was demanded, and was in a measure obtained. Next, a system of return feeders to supplement the rail return was added; and still the troubles were not lessened materially. Some few cities tried to compel the traction companies to supply the double trolley system; but this has not proved a success. Litigation has been said to have cost some companies more than the damage from electrolysis, but it would seem that it has availed little in forcing the needed relief. As a general rule, those companies have fared best who have enlisted the co-operation of the traction companies in an endeavour to reduce the damage to the lowest possible point. Some traction companies have paid a portion of the cost of renewing pipes destroyed by electrolysis; but these cases are exceptional. While we have direct current traction, some other means must clearly be found.

At the present time, a new factor is entering into the problem, and one that happily offers relief to a large degree from the damages caused by electrolysis. I refer to alternating current traction. This new system is giving to the electric traction industry a new impetus, which up to the present time has been confined largely to inter-urban and long-distance lines, but which is destined to come into use in our large cities as soon as it is proved practicable on the longer lines; and there seems to be no reason to doubt the practicability of the system. It is a well-known and established fact that an alternating current does not cause electrolysis to nearly so great an extent as does direct current. In fact, it is often stated that the alternation of the direction of flow will entirely stop electrolytic action.

On this point, however, there seems to be some question. In a thesis presented for a degree at the University of Wisconsin, a report is made of a series of tests to determine the amount of electrolytic corrosion caused by the ordinary 60-cycle alternating current; and their findings establish the fact that corrosion is accelerated by an alternating current, though the amount of action is very small compared with direct current electrolysis. It is possible that the increase in corrosion in this case is not due directly to electrolysis, but to the fact that the protecting scale does not form, as I have explained in the case of a direct current entering a pipe and causing increased corrosion. An extended series of tests would be necessary to decide upon the correct solution of this point. In view of certain legal decisions that the railway companies can be compelled to provide the system which is considered best modern practice, it would seem that the interest of gas companies should be enlisted in an endeavour to prove that the new system is "the best modern practice;" and I am confident that within ten years it will be so regarded.

Leaving the consideration of this matter, I wish to take up the question of the protection of the existing systems from direct current electrolysis. Gas men are apparently almost equally divided into two classes, both of which maintain that electrolysis is best prevented by their general system of protection. Broadly speaking, these two classes consist as follows: (1) The class who believe in bonding their pipes to the return circuit, and causing as much of the current as possible to leave through these bonds; and (2) the class who aim to make their pipes as poor conductors as possible, and thus prevent, as far as possible, all current from entering their pipes. In addition, there are various combinations of the two general systems to be found.

Taking up the first general class, it is apparent that, if all current could be collected and kept on the pipe until removed through the bond, it would offer an ideal solution of the problem. The placing of bonds between the pipe and the return circuit in the negative area, however, often not only does not help conditions, but makes them much worse. The conductivity of the circuit through the pipe is increased greatly, and as a result more current follows the pipe. With cast-iron mains, we find the greatest trouble caused by current jumping round the joints; and the greater the current flow in the pipe, the greater becomes this tendency to jump the joints, and therefore the greater is the damage to the system. This is especially true where cement joints are employed; and there seems to be hardly a case where bonding would be advisable when these are used. Even if the pipe were of uniform conductivity, there would be a tendency for current to follow it through earths of high resistance, and leave it again when earths of better conductivity are encountered. In order to make an ideal of this system, it would be necessary to provide pipes, the conductivity of which would at all times be so much greater than that of the surrounding earth that little current would tend to leave the pipe for other paths. This, however, is a physical impossibility; and the system offers at best but little relief in the average case.

The other general system has as its ideal fulfilment a pipe that is a non-conductor. It aims to keep all current from following the pipe. From the gas man's standpoint, it is the ideal system. When bonding is advocated by gas companies to remove current from their pipes, they partially, at least, concede the right of the traction companies to use their pipes as a return circuit. This weakens their position in case they take a claim for damages into the Courts. The nearest approach to the ideal system is found in the extensive use of insulating joints to break the continuity of the pipes as return conductors; thus reducing the amount of current carried by the pipes to as small an amount as possible.

The proper installation of insulating joints is a very important engineering difficulty, and one in which every case is a special problem involving quality of earth, moisture, &c.; the aim in each instance being to allow as little current as possible to jump round the joint. Of recent years, the tendency to use wrought-iron

instead of cast-iron mains has spread wonderfully. Without here involving myself in a question as to the relative merits of the two, I wish to call attention to the statements of a manufacturer of insulating couplings and patent couplings extensively used for natural gas, to the effect that it is possible to lay wrought-iron pipe with an insulating coupling every second joint at a lower first cost than for screw pipe of the same size. This point is well worth careful consideration by every gas manager. Considered from the standpoint of reduction in leakage, the shorter life of wrought-iron pipe is overcome by the reduction in lost and unaccounted-for gas as compared with cast-iron pipe.

Electrolysis occurs when a current leaves a conductor through an electrolyte. In our case, the pipe must be a conductor and the current leave through earths that are electrolytes. This points out two fundamental methods of curing our troubles: (1) We must use pipes that are not conductors; and (2) insulate all pipes from the surrounding earths by a protective covering. Lately there has been announced in France the results of tests with paper gas-mains that offer considerable promise. The mains in question were tested under 300 lbs. pressure, and then subjected to regular service in the ground for some time, and were pronounced as good as new when removed for inspection. I am informed that experiments along this line are being started in America; but I cannot secure any information as to the results obtained.

Some years ago, the use of vitrified pipes was much agitated in America. Climatic conditions seemed to preclude the possibility of employing them in the northern sections. More recently, English patents have been issued on a concrete pipe and system of installation. With the present activity in steel concrete construction, it would seem that there is considerable promise along these lines. The strength of the pipe could easily be designed to at least equal that of cast iron. Several experiments have been tried in this direction, and I expect to see the matter presented in definite shape for the consideration of gas and water companies within a short time. It would really make a report of the greatest importance.

The second essential in the prevention of electrolysis would seem to offer a most interesting field—the invention of a pipe covering that will protect the pipe, and prevent current from leaving it through an electrolyte. The prime factor in such a covering is that it must be moisture proof. If moisture proof, it would of necessity be gas-tight; and leakage could not occur. How much added investment could our companies make per mile of main to prevent leakage alone? Balance interest on investment against the cost of gas lost by leakage, and the results will show what expenditure would be justified from this point of view. The subject of coverings for mains and service-pipes has been extensively investigated; but, so far as I know, no one has produced an entirely successful one. Experiments with a cement covering for pipes have shown that there is a great deal of merit in it if properly applied. Several tar mixtures, such as that of Hickenlooper, are in use for tarring service and small main pipes, and that they are beneficial cannot be denied; but they are not sufficient enough. Tarring and boxing service-pipes have proved a decided success in some cities, and records show that they greatly increase the life of the service and decrease the leakage. Boxed pipes show very little deterioration from corrosion; and, to my mind, this process offers the best protection in use at the present time, and there seems to be an increasing popularity for this method of protection. Attempts are being made to devise a covering that can be moulded on the pipe at a low first cost. Forcing-jacks are coming very extensively into use, and an extremely strong casing would be required if the pipes were to be forced. Such a covering would have many advantages, and would be a very excellent thing.

The whole subject of electrolysis as applied to any case should be studied with one fundamental law in view—viz., "Prevent all current from leaving the pipes through an electrolyte." The nearer we can approach to this condition, the better will conditions become. The interests of the gas fraternity are at present directed largely to the following features of the problem; and future advances towards a solution of the problem may be expected from them. These features are: (1) The introduction of alternating current traction in our cities. (2) The invention of a satisfactory protective covering. (3) The production of a new class of electrolysis-proof pipe. (4) The industrial application of the fundamental rule to existing systems and conditions.

[APPENDIX.]

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COAL TAR AND OIL FOR TREATING ROADS.

Experiments at Jackson (Tenn.).

In the course of the past year, the Office of Public Roads at Jackson (Tenn.) co-operated with Mr. S. C. Lancaster, the City Engineer and Chief Engineer of the Madison County Good Roads Commission, in making a series of careful experiments at Jackson, to determine the value of coal tar, crude Texas oil, and several grades of its residue, when applied to earth and macadam roads. The official report of this work has been published; and the following extracts from it, taken from "Engineering Record," will doubtless be read with interest in connection with what has lately appeared in our columns on the subject.

The macadam streets in the business centre of the city were constructed originally of the hard siliceous rock known as "Novaculite." A year ago, after fifteen years of wear, repair of these streets became necessary. The old surface was first swept clean with a horse sweeper, so as to expose the solid pavement beneath. This was done because tar will not penetrate a road surface which is covered with dust and loose material. Next, the surface was loosened by spikes in the wheels of a 10-ton steam-roller, the streets re-shaped, and the new material added where needed. The road was then sprinkled, rolled, bonded, and finished to form a hard, compact, even surface, and allowed to dry thoroughly before either tar or oil was applied, as these substances cannot penetrate a moist road surface. The best results are obtained when the work is done in hot, dry weather, and accordingly the tar was first applied in August. Other sections of streets and roads were constructed entirely of new material; but no tar or oil was put on them until after they had been subjected to traffic. Sections of country roads which had been made for one or two years were also treated with tar and oil.

The tar used came from Ensley (Ala.), and was a bye-product from the manufacture of coke. It was practically free from

moisture. A portable boiler was connected with the steam-coils of the tank-cars, in which it was delivered, to heat the tar and keep it hot; thus saving time in bringing it to the temperature desired for spreading on the road. It was then taken from the cars and poured into a tank-waggon of 500 gallons capacity by means of a hand-lever pump. This portable tank had a small fire-box under one end, with a flue running directly beneath the tank to a smoke-stack at the other end. A fire was kept in the box, and the tar brought to a temperature which generally reached 210° Fahr., but when placed on the road it was reduced to from 160° to 190° Fahr. The hottest tar produced the best results. A horizontal pipe with an adjustable longitudinal slot, attached to the rear of the waggon, and extending down close to the surface of the road, was first used to spread the tar; but this became clogged, and did not give an even flow. It was therefore abandoned, and in place of it a piece of four-ply 1¼-inch rubber hose was used. This had a nozzle of 1-inch pipe, slightly flattened at the end to produce a broad stream, and was provided with a valve for controlling the flow. The tar was spread with this hose over a radius of about 15 feet of road surface.

Labourers, with street-cleaners' brooms of bamboo fibre, followed the tank, and swept the surplus tar ahead. They spread it as evenly and quickly as possible, and in a layer only thick enough to cover the surface. One side of the street was finished at a time; and barricades were placed to keep off the traffic until the tar had had time to soak into the ground. Under a hot sun, with the road surface thoroughly compact, clean, and dry, and with the tar heated almost to the boiling-point and applied as already described, the road will absorb practically all of it in eight or ten hours. A light coat of clean sand, screenings, or the clean particles swept from the surface of the road, may then be spread as evenly as possible, and rolled in with a steam-roller. These different top layers were applied to various sections, and in one case the road was left to dry without spreading anything except the hot tar. In another instance, sand was applied to the tar within two hours, which resulted in the absorption of the tar by the sand, and lessened its penetration of the road surface. It was necessary to remove this sand-tar mixture, which peeled up under traffic. A sufficient amount of tar, however, had penetrated the surface of the road to make it waterproof, and after more than seven months of service this section of street is in good condition. In spreading the coat of material for drying the surface of the road and absorbing the surplus tar, only enough should be used to cover it lightly, as after rolling this surplus material will be washed or blown away, or it may be removed with street sweepers and the surface left smooth and clean.

The following table gives the cost of labour per square yard in preparing the road and applying the tar in five different experiments:—

Area Covered. Sq. Yds.	Tar per Sq. Yd. Gallons.	Sweeping.	Hauling and Heating Tar.	Applying Tar.	Applying Sand.	Rolling.	Total.
972	0·43	0·12c.	0·11c.	0·25c.	0·28c.	0·06c.	0·82
1455	0·34	0·12	0·09	0·30	0·27	0·06	0·84
4720	0·42	0·17	0·13	0·28	0·37	..	0·95
4658	0·53	0·12	0·12	0·30	0·29	..	0·83
1440	0·40	0·18	0·05	0·14	0·19	..	0·56

No account of lost time was kept. Negro labour was used, at $1·25 for a ten-hour day; and $3 per day was paid for teams. The quantity of tar per square yard was computed from the number of gallons used on the areas covered in the different sections, and varied slightly. The average quantity was 0·45 gallon. Little difference resulted in the appearance of the various sections. The tar was spread with the slotted pipe in the first two experiments, and with the hose in the last three. Sand was used for a top layer in the second, fourth, and fifth experiments; while sand and clean sweepings were used for this layer in the first, and limestone screenings in the third. Rolling was only done at odd times, and no exact cost can be given of this item in the last three experiments. The average cost per gallon of filling the tank, heating the tar, and hauling it to the road was 0·24c. To obtain an approximate total cost per square yard of this work, add the cost of 0·45 gallon of tar, which was the average quantity applied per square yard, to the cost of labour per square yard.

After more than seven months, including the winter season of 1905-6, the tarred streets and roads are still, it is reported, in excellent condition. They are hard and smooth, and resemble asphalte, except that they show a more gritty surface. The tar forms a part of the surface proper, and is in perfect bond with the macadam. Sections cut from the streets show that the tar has penetrated from 1 inch to 2 inches; and the fine black lines seen in the interstices between the individual stones show that the mechanical bond has been reinforced by the penetration of the tar. The tar is, in fact, a matrix into which the stones of the surface are set, forming a conglomerate or concrete. A second coating, applied a year after the first, would require much less tar, as the interstices of the rock would then be filled.

A tarred street is dustless in the same sense that an asphalte street is dustless, though a fine sandy powder wears off as in the case of asphalte. It can be swept or washed clean. These roads dealt with have since been swept regularly; and the city authorities are in favour of treating all the streets with tar. The cleaning that would soon ruin an ordinary macadam road does not injure the tarred surface, as the stones are not torn up or disturbed. The tar itself has antiseptic properties; hence its use would be beneficial both as a germicide and as a means of securing cleanliness.

On one section of country road, a coating of light crude Texas oil was first applied, and after it had penetrated, a coat of hot tar was spread over the surface. After allowing this to dry for 18 hours, a coating of sand was spread over the tar. This has given fairly good results; but it was no improvement over the tar spread on the dry road, as the oil seems to have to some extent prevented the penetration of the tar. On certain of the city streets, the unbound stone between the rails on the car-tracks was covered with tar, and this has resulted in a hard waterproof surface from rail to rail. Previously the stones were loose and troublesome from lack of traffic, and heavy rains washed the track out badly on the steep hillsides.

Coming to the experiments with oils, the quality varied from a light crude oil to a heavy viscous residue from the refineries. Upwards of seven miles of country road and several city streets were treated. At first, some of the lighter crude oils were applied from the same tank-waggon that was used for the tar. Hose and brooms were used to spread the oil, and practically the same process was followed as with tar. The oil soaked very quickly into the macadam, and left no coating on the top. It caused the light covering of sand which was applied to pack down, and gave the road a darker colour. The crude oil was used cold; and the cost of applying it is given below. On a city street, an area of 8266 square yards was treated, at the rate of 0·48 gallon of oil per square yard, by means of the tank-waggon and hose. The cost of labour per square yard was as follows: Sweeping street, 0·11c.; filling tank and hauling, 0·08c.; oiling street, 0·24c.; spreading sand, 0·14c. —total, 0·57c. On a country road, 2000 gallons of oil were spread, covering 5206 square yards, at a rate of 0·38 gallon per square yard. The average haul was a mile. The cost of labour averaged 0·33c. per square yard. It took nine men 30 minutes to spread 500 gallons, or one tank load; and the 18-feet road was covered at the rate of 1860 feet per hour. It took 28 minutes to fill the tank with oil. With an ordinary street sprinkler, one man and a team spread a load of 600 gallons of oil in 15 minutes. The sprinkler thus spread 600 gallons in half the time it took nine men with the tank-waggon to spread 500 gallons.

The following was the cost per square yard for putting residual oil on city streets with the use of the tank-waggon; approximately 0·71 gallon of oil being used: Sweeping street, 0·10c.; heating, loading, and hauling, 0·17c.; oiling street, 0·29c.; spreading sand, 0·22c.—total, 0·78c. In applying the greater part of the oil on the country roads, the following men and equipment were used: A foreman, at $2 per day; six labourers at $1·25 per day for working on the road and pumping oil at the car; a tank-waggon and a street sprinkler, at $3 each per day; two firemen, at $1·50 per day, and a ton of coal. This force spread in one day 3300 gallons. No sweeping was done, except to remove manure and spread the oil where it was inclined to puddle. No sand or other material was applied to the road after oiling. More than seven months have elapsed since the work was finished; and the light crude oil has produced little, if any, permanent results. The roads where it was applied are but slightly changed, and some dust arises on them from traffic. The oil was too volatile for the purpose. The medium steamer oil from Texas, on the other hand, has given good results; but the best were obtained with the heavier oils, used when hot. The road treated with these is entirely dustless.

Analysis of Gas from Boldon Coal.

It will doubtless be remembered that, in the course of the discussion on Herr Körting's paper at the meeting of the Institution of Gas Engineers, Mr. A. F. Browne, remarked that the value of the communication would have been greatly enhanced if the author could have furnished a complete quantitative analysis of the gas made from Boldon coal under his contrasted conditions. In replying upon the discussion, Herr Körting said he should be pleased to adopt the suggestion, and publish the analysis required. We have now received from Mr. H. F. Andresen, the Assistant-Secretary of the Imperial Continental Gas Association, the following figures sent by Herr Körting:—

Analysis of Gas from Boldon Coal.

[Vertical Furnace, Mariendorf Gas-Works.]

	Per Cwt.
CO_2	1·3
C_nH_m	3·8
CO	7·1
H_2	58·9
CH_4	26·4
N_2	2·5
	100 0

Heating Power.

[At 15° Celsius and 760 mm. Bar.]

Upper	5340 calories.
Lower	4736 ,,

Mr. George White, who was for some time with the New Conveyor Company, Limited, has become Joint Managing-Director of the Gilbert Little Company, Limited, of Horton Works, Bradford.

REGISTER OF PATENTS.

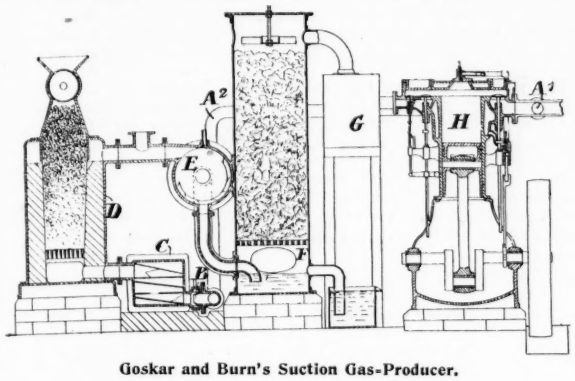
Suction Gas-Producer Plant.

GOSKAR, T. A., and BURN, L., of Charlton, S.E.

No. 11,725; June 5, 1905.

The patentees arrange to allow the motor piston to induce into the generator a mixture of gases, principally composed of the exhaust gases, the remainder being air, and (when necessary) added steam. The generator is thus served with carbon dioxide for direct conversion into carbon monoxide; superheated steam for conversion into hydrogen and carbon monoxide; air to burn just sufficient carbon to provide the amount of heat necessary to carry on the chemical reactions, any unburnt combustible gases which might remain in the exhaust gases, and also a large proportion of the heat generally wasted.

The exhaust gases to be returned to the generator leave the main exhaust pipe at A^1, and are conveyed in the branch pipe A^2 to the nozzle B, where the air necessary for combustion is added. The air is drawn in by the induction of the engine piston through a regulating valve. The combined air and exhaust gas then pass into an "exhaust silencer," to steady the flow of the exhaust gas. The plant may work without an



Goskar and Burn's Suction Gas-Producer.

anti-pulsating chamber; but when one is fitted, it is at C. The passage between the plates in it is small in area near the inlet, and gradually increases towards the outlet. Thus the gases gradually expand and flow steadily into the generator D—of any known design, but preferably a simple iron casing fitted with a feed hopper, and lined with fire-bricks.

The gases may be cooled and cleansed by arranging for them to pass through a centrifugal scrubber E, where they whirl round the inner periphery, and the vanes assist in separating dust, tar, &c., from them. A jet of water is arranged to carry the impurities to any convenient waste tank. The gases leaving the centrifugal scrubber pass into the scrubber F, which is a cylindrical casing containing coke or other suitable material, over which water constantly flows. The cooled gases may or may not pass into an anti-pulsating box G, which forms a reservoir from which the engine H draws its supply of gas. The engine may be of any known design, with the addition of a force pump, which draws water from the jacket and forces it to the spraying device shown, with the object of arranging the exhaust gases to leave the cylinders with a suitable proportion of water to enrich the combustible gases.

Refractory Bodies for Heating Purposes.

DELARGE, M., of Paris.

No. 12,468; June 15, 1905. Date claimed under International Convention, Oct. 26, 1904.

This "composition for the manufacture of refractory bodies designed to be heated by a bunsen flame so as to serve for the heating of apartments mainly by radiation, . . . differs from other bodies which have been employed as incandescing bodies in this respect that, instead of giving out light efficiently, it has great efficiency in giving out heat."

The essential ingredient in it is oxide of cerium; but instead of employing this in minute quantities as in the manufacture of incandescent mantles for lighting, to get the best results proportions varying from 10 to 50 per cent. are employed with 80 to 50 per cent. of other refractory materials.

When the refractory bodies have to be handled frequently, and therefore must not be fragile, they are made of cylinders, either solid or tubular (pierced with holes, and closed at the top), composed of 30 to 50 per cent. of oxide of cerium and 70 to 50 per cent. of oxide or silicate of aluminium in the form usually employed in the manufacture of porcelain articles. These bodies are thoroughly mixed and moulded and fired in the usual manner. It is preferable, however, instead of having the oxide of cerium incorporated throughout the whole mass of the refractory body, to have it at or near the surface only. So, instead the cylinder of oxide or silicate of aluminium ready baked is soaked in a solution of nitrate of cerium, which is afterwards heated to convert the nitrate into oxide, or else the cylinder is soaked in an emulsion of oxide of cerium in water, and thereafter baked.

When the refractory body does not require much handling (and may therefore assume a more fragile form), it is made of the shape of a reticulated mantle prepared like a "Welsbach" mantle, but of a much stronger and more solid form. Thus having made a mantle consisting of (say) 90 per cent. by weight of oxide of aluminium, 8 per cent. of oxide of magnesium, and 2 per cent. of oxide of beryllium, the mantle so formed is dipped in a solution of nitrate of cerium in water and heated in order to convert the nitrate into oxide. This dipping and heating are repeated until the mantle contains from 10 to 30 per cent. by weight or thereabouts of oxide of cerium; and it is then protected by collodion in the way employed with mantles used for lighting.

Distillation of Tar, Naphtha, &c.

SOCIÉTÉ DES COMBUSTIBLES INDUSTRIELLES, of Haine-St. Paul, Belgium.

No. 16,182; Aug. 8, 1905. Date claimed under International Convention, Dec. 19, 1904.

All the hydrocarbons (coal tars, wood tars, naphtha, naphtha residues, schist, oils, &c.) are generally distilled in retorts, the patentees remark, with the assistance of a current of superheated steam, which facilitates the emission or evolution of the gases in the mass by carrying them away. But this process involves a cooling action upon the mass under distillation, which has to be compensated for by the heat of the furnace—such cooling likewise causing deposits to occur at the bottom of the retorts, which greatly reduce their life when high temperatures are attained.

It has been proposed, in distilling coal tar, to blow heated air through the tar while heating the still during the entire distillation; and it has also been proposed to pass heated air through sludge oil (with or without simultaneous heating of the still), for the purpose of oxidizing and resinifying the oil. It has further been proposed to pass a current of air—dried and cleansed by passage through a filter saturated with sulphuric acid and subsequently heated—through the vapours evolved by the heat of the air in a rectifying column and a series of closed vessels from distillers' mash, hydrocarbons, or alcohol, for the purpose of distilling and rectifying the same; oxygen and ozonized air being sometimes employed in conjunction with, or in place of, the heated air for oxidizing the vapours. It has also been proposed to distil hydrocarbons simultaneously into various spirits and oils by blowing superheated steam or air through the hydrocarbon in a vessel disposed in a special still, so as to vaporize the hydrocarbon; the heavier and lighter vapours evolved being drawn off from the different points of the still according to their specific gravity.

Now, according to the present invention, the hydrocarbon is first heated to a suitable and special temperature, depending on the particular product to be treated, and then superheated dried and purified air, enriched or not with oxygen or ozone according to circumstances, is passed through the hydrocarbon in the distillation vessel—the distillation being completed by the heat generated in the mass itself by exothermic reaction. The temperature to which the air is superheated should be about, and not more than, 20° C. below that to which the hydrocarbon has been heated and at which distillation will commence when the air is admitted through the hydrocarbon at approximately the same temperature as explained. A suitable temperature for general purposes may be taken to be about 350° C.; but this may vary according to different requirements and with different hydrocarbons.

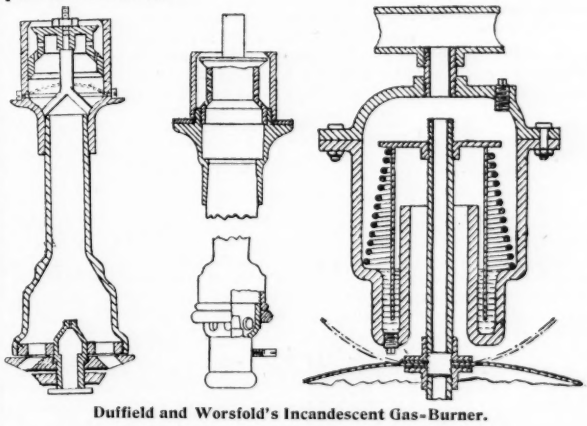
For the sake of illustration, if a heavy tar of naphtha be taken, the distillation of which has been carried to (say) 350° C., such tar will still contain about 70 per cent. of oils; and in order to eliminate these by the ordinary methods, it would be necessary to distil up to 440° C. According to the improved method, this tar is introduced cold into a retort and heated in any suitable way. As soon as the mass attained a temperature of about 200° C., air is begun to be bubbled through the mass in the retort; the air being purified, heated, dried and enriched or not with oxygen or ozone, according to the greater or less affinity which the hydrocarbon to be treated possesses for oxygen. In this way, it is possible, with a temperature (for example) of 100° C. less than that attained in the ordinary methods, to distil with a current of air treated as described, without heating the retort, and to obtain distillation products of higher density and entirely different molecular composition to those obtained by the present known means.

Incandescent Gas-Burners and Lamps.

DUFFIELD AND SONS, of Queen Victoria Street, E.C., and WORSFOLD, J., of East Dulwich, S.E.

Nos. 13,265, 13,266, and 13,267; June 27, 1905.

The first of this series of patents relates to atmospheric gas-burners intended for either upright or inverted incandescent gas lighting. The objects aimed at are to effect a better admission of air to, and admixture of air and gas in, the mixing-chamber of the burner, and to effect a further and intimate mixing of the air and gas before it issues at the point of the burner.



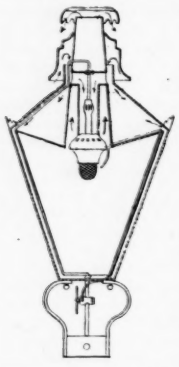
Duffield and Worsfold's Incandescent Gas-Burner.

To this end, the tubular body of the burner is made with an enlargement at each end to constitute mixing-chambers; and the air and gas

are admitted to one chamber at an angle to one another, and then pass through the tube to the other chamber, in which is situated a flanged cap having perforations designed to give converging jets. The invention principally consists in improving the construction and arrangement of such cap and the mouth of the burner so that the gas and air mixture is made more intimate, and issues from the burner in a condition suitable for effecting "more or less perfect combustion." The method of effecting more intimate admixture of gas and air by arranging nozzles or apertures so as to give converging jets in burner mixing-chambers is, of course, well known, but the particular arrangement referred to here will be apparent from the engraving.

The second invention relates to gasaliers, gas-pendants, and other supports for gas-burners, and has for its principal object to construct an anti-vibratory support suitable for carrying incandescent gas-burners in exposed places where incandescent mantles usually suffer owing to the excessive vibration due to wind or traffic, or to the excessive vibration in the neighbourhood of heavy machinery. This invention consists in employing a gas burner or lamp carried upon a spring-supported bell, mounted in, or dipping into, an annular cup containing a liquid seal of mercury, or other suitable liquid, as shown in the engraving.

The third invention (relating to gas-lamps) is intended to provide means for preventing the admixture of gases of combustion with the air entering the mixing-chamber of the burner and to prevent the overheating of the burner, by the products of combustion. The air for combustion and the products of combustion are isolated, by an arrangement of concentric tubes, in such a manner that, while they are not permitted to mix with one another, the gases of combustion nevertheless effect a heating of the air and thereby produce a "much more efficient flame." In the construction shown, the burner, or the upper part of it, is arranged within a tube closed at the bottom (say) by a plate, or by the cone of porcelain or the like, which in some burners constitutes the support for the inverted mantle. This air-isolating tube may be conveniently suspended in the chimney for carrying off the products of combustion. Part of the gases of combustion escape to the chimney from the inside of the mantle by way of a ring of apertures in the cone or mantle support; the apertures being arranged adjacent more or less to the lower circumference of the air-isolating tube. The remainder of the combustion gases enter the chimney through an annular space between the burner or the mantle-holder and the lower end of the chimney. The gas supply-pipe is led in the ordinary manner up one side and up beneath the roof of the lantern, or it may be inserted through a hole in the chimney; and it then passes downwards, and is inserted into the air-isolating tube, where it is connected to the burner proper.



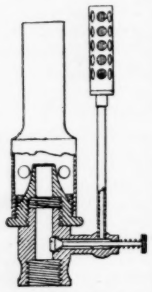
Inverted Gas-Burner Lamp.

Igniting Incandescent Gas-Burners.

BAER, M., and FLACHSHAAR, P., of Berlin.

No. 17,062; Aug. 23, 1905.

This invention refers to an arrangement for igniting gas-burners, where the pilot-light is not constantly burning, but is only set alight when the main flame is required. To effect the ignition an ignition pill is used, which, through the escaping gas, is brought to a red heat. The gas is shut off from the pilot-light by a valve, and is only opened again to give the pilot-light the necessary quantity of gas. The main-pipe for the burner remains always open.



Baer and Flachshaar's Self-Lighting Burner.

Into the cone of the burner is screwed a nipple, on the side of which is attached a gas-pipe, above which is a tube carrying inside an ignition-pill. On opening the valve, the gas enters through a bye-pass pipe heating the pill inside the tube and igniting the gas. Inside the valve body is a valve cone the spindle of which projects from the valve body; the valve spindle being provided with a knob and being worked by a spring. The incandescent mantle is placed on the burner in the ordinary way. To light the gas, the main-pipe is first of all opened, when the spindle of the valve is pushed down to allow gas to enter the burner, and at the same time into the bye-pass pipe towards the ignition pill. The pill now begins to glow, igniting the rising gas, which will also ignite the gas inside the burner.

Lamplighter's Torch.

SUGG, W., of Regency Street, Westminster.

No. 24,311; Nov. 24, 1905.

In the Foulger-Glover torch for lighting gas-lamps there is (the patentee points out) a small lamp situated in a metal casing on the top of a pole; and when the lamplighter has introduced the torch into the lantern and pulled a string, the shutter is withdrawn and the lamp tilts forward to light the gas. The construction of the lanterns, however, necessitates the employment in such torches of a metal casing comparatively short above the lamp, so that the flame of the lamp may be at the proper level for lighting the gas.

In practice, it is said to be found that, with such a short casing, the smoke from the lamp impinging on the top is liable to create soot and extinguish the light; and there is also a danger of the wind blowing out the light, because the perforations or air holes in the casing can only be placed directly opposite the flame of the lamp.

According to the present invention, these disadvantages are to be obviated by the application to the torch of a telescopic end which, while normally providing a sufficient height for the flame within the torch casing, permits also of the length of the flame casing being reduced for the proper accommodation of the torch within the lantern.

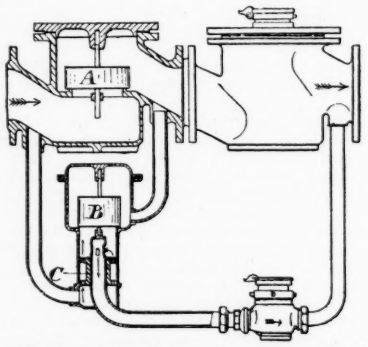
Control Meters for Water-Mains.

MEINECKE, C., of Breslau-Carlowitz, Germany.

No. 3877; Feb. 16, 1906.

This invention relates to a system of controlling valves for an installation of water-meters for measuring variable water supplies. Large meters connected with the mains—the patentee points out—fail to register small supplies; and it is thus necessary to adopt with each large meter a co-acting bye-pass meter controlled by a reversing valve. This arrangement, however, is not sufficiently effective for accurate measurement by reason of the inertia of the large meter in starting, and the consequent escape of unregistered water. Correct registration of variable service-supplies can, he maintains, only be effected by adopting the more recently applied system of passing the water each time, according to consumption, either through the large meter or the bye-pass meter alone. But the imperfect results hitherto attained with this system being due to difficulties in effecting an instantaneous opening and closing of the controlling valve for diverting the flows through any one of the meters at regular predetermined service-supplies, it is the object of this invention to obviate the difficulties referred to by controlling valves and a peculiar installation of the combined main meter and bye-pass meter.

The means suggested for automatically diverting the flow either through the main meter or through the bye-pass meter according to the momentary service requirements, consists essentially of three independent controlling valves A, B, and C. In the arrangement shown, the valves B and C are mounted in communicating chambers. A pipe leads to the bye-pass meter, but is closed at its inner end. It has lateral inlets for the water. The upper end of the pipe provides a guide socket for the lifting valve B, and on the pipe itself is mounted the sliding or drum valve C, adapted to move vertically in the lowest



Meinecke's Control Meters for Water-Mains.

chamber. The valve C has a rim or flange at each end fitting the valve-chamber and having holes in it. The upper flange carries a check-plate or ring (formed with corresponding holes), adapted to turn so as to more or less obturate the holes in the flange of the valve for the purpose of regulating the passage of the water and so adjust the valve motion for a predetermined pressure. From the chamber B a pipe returns into the main service-pipe at the inlet of the large meter near the high-pressure valve A.

During reduced flows for consumption, the water is unable to lift the valve A, and therefore passes from the valve-chamber beneath the valve C, then through the perforated flanges of the latter, and escapes through the inlets in the pipe to the small meter, and finally through the egress pipe into the main service-pipe at the rear of the large meter. When the consumption increases, there will be a corresponding difference of pressure at the top and bottom of the valve C; and finally the excess of pressure will be sufficient to overcome the weight of the valve and move it suddenly upward, so as to close the apertures. At the same time the pressure beneath the valve B lifts the latter, and the flow takes place straight upward into the large meter, which immediately starts registering. As a further increase in consumption would tend to create a vacuum at the top of the valve A, the latter is forced open by the ensuing strong flow, and delivers direct into the large meter.

With reduced consumption, the action takes place in the reverse but similar manner. The valve A, by reason of its superior weight, closes first; and the water supply then passes only to the large meter. A further reduction of flow produces a modification of pressure beneath the valve C, and allows it to fall, by its weight, so as to open the apertures and divert the flow towards the small meter. In consequence the pressure is no longer sufficient to keep the valve B lifted, and the latter immediately closes the supply to the large meter.

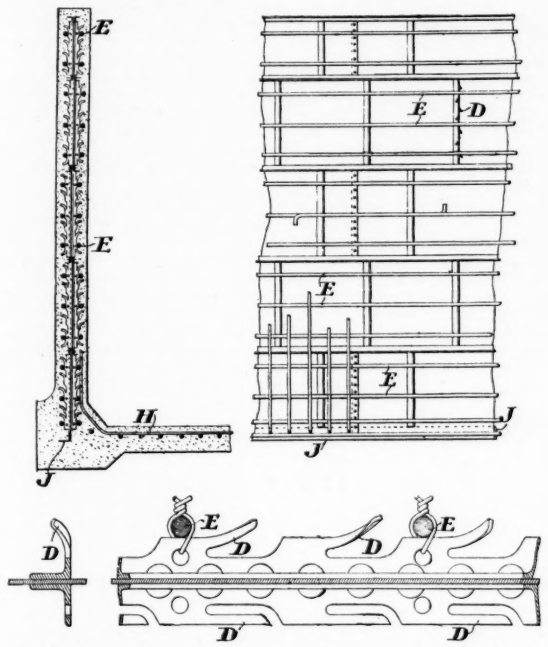
Ferro-Concrete Tanks and Reservoirs.

WARING, C. E. D., of Chiswick.

No. 5049; March 1, 1906.

The patentee's proposal is to embed in the walls of the tank or reservoir plates of suitable material, either connected together so as to form a continuous barrier to the passage of the water, or arranged to overlap, with the spaces between the over-lapping parts filled with concrete; the plates thus forming baffles so arranged that the water would have to take a sinuous course before appearing on the outside of the wall.

In one form of the invention, plates or sheets of metal may be used, embedded in, and keyed to, concrete by metal projections fastened thereto and supplemented in some cases by metal reinforcements. The bottom of the tank or reservoir may be entirely of concrete or made of plates or sheets of metal, according to the position of the tank and the requirement of the foundation.



Waring's Ferro-Concrete Construction for Tanks and Reservoirs.

The illustrations show a vertical section of a tank wall, and a face view with the concrete removed ; also details of construction.

The metallic framing or skeleton of the walls of the tank is formed of iron plates riveted together along both the horizontal and vertical seams, and caulked where necessary. Along each side of the horizontal joints of the plates, and riveted thereto, are angle irons, and vertical angle irons are also riveted to either side of the plating at suitable intervals apart.

The projecting flanges of the angle irons are sheared or slotted and then bent, as shown in the details, whereby tongues D are formed, which serve, when the structure is embedded in concrete, to obtain an efficient hold. Such a construction may be employed without further metallic reinforcements ; but for large structures it is preferred to combine this construction with other metallic reinforcements—such as those employed in the Hennebique system. Such a combination is illustrated ; E being iron rods disposed horizontally and attached at suitable distance apart to the vertical angle irons by means of wire loops threaded through holes formed in the angle irons.

The floor of the tank may be constructed either of solid concrete rendered, or similar to the walls just described, or of ferro-concrete of any known type. The drawings show a ferro-concrete construction where the rods H in the floor are continued vertically up the side of the walls as at, and attached to, the horizontal rods E, by tying with wire. The base of the metallic wall framing or skeleton is preferably riveted to angle irons J.

In situations where it would be inconvenient to rivet the plates together, they can be arranged so as to overlap for a sufficient distance both vertically and horizontally, leaving a space between such overlap for filling with concrete.

APPLICATIONS FOR LETTERS PATENT.

14,972.—KROGMANN, C. H., "Production of air gas." July 2.
14,974.—WRIGHT, J. W. B., and DARWIN, H., "Gas cooking-stoves." July 2.
15,013.—TERVET, W. P., "Testing gas." July 2.
15,014.—RÜBENKAMP, A., "Gas-producers." July 2.
15,027.—SAUL, J. H., "Bye pass burners." July 2.
15,067.—ELTON, Sir E. H., and STEPHENS, R., "Lighting and extinguishing gas-lamps from a distance." July 2.
15,074.—STEWART, J., "Gas-producers." July 3.
15,090.—BULL, J. W., "Gas-cookers." July 3.
15,212.—ROOK, G. E., F. M., G. T., & J. E., "Anti-freezing device for gasholders." July 4.
15,234.—SABATIER, P., "Manufacture of gaseous mixture containing hydrogen and methane." July 4.
15,295.—ALBRECHT, H. C., "Incandescent mantles." July 5.
15,326.—SABATIER, P., "Manufacture of a gaseous mixture containing hydrogen and methane." July 5.
15,337.—FRANCIS, A. S., "Inverted burners." July 5.
15,358.—POGSON, W., "Globes and shades." July 6.
15,379.—FORD, G. T., "Water and gas main joint." July 6.
15,419.—PORTE, P., "Acetylene producers." July 7.
15,439.—WEBBER, J., "Incandescent gas-lamps." July 7.
15,446.—BEUTNER, G. F., "Suspending inverted mantles. July 7.

Messrs. W. A. Valon and Son have been retained by the Nantwich Urban District Council to advise them on matters connected with their rating.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills :—

Bills brought from the Commons, read the first time, and referred to the Examiners : South Lincolnshire Water Bill, Sutton Water Bill.
Bill read a second time : Kingston-upon-Hull Corporation Bill.
Bills reported : Ascot District Gas (Electric Lighting Bill), Bacup Corporation Bill, London County Council (General Powers) Bill, Rochester, Chatham, and Strood Gas Bill, Todmorden Corporation Bill, Watford Gas Bill.
Bills read the third time and passed : Cardiff Gas Bill, Cheltenham Gas Bill, Huddersfield Corporation Bill, Manchester Corporation Bill, Metropolitan Water Board Bill, Peterborough Gas Bill.

The Kingston-upon-Hull Corporation Bill, the Poole Corporation Water Bill, and the Water Provisional Order Bill have been referred to a Select Committee, consisting of Lord Kintore (Chairman), the Earl of Stradbroke, Lord Zouche, Lord Borthwick, and Lord Castlemaine ; to meet to-day.

HOUSE OF COMMONS.

The following further progress has been made with Bills :—

Lords Bill read a second time and committed : Great Yarmouth Water-Works and Lowestoft Water and Gas Bill.
Lords Bill reported : Portsmouth Water Bill.
Bills read the third time and passed : Newport Corporation Bill [Lords], South Lincolnshire Water Bill, Sutton District Water Bill.

On Monday last week, the petition of the Crediton Urban District Council against the Crediton Gas Bill [Lords] was withdrawn, and the Bill was next day referred to the Committee on Unopposed Bills.

Petitions against the Water Orders Confirmation Bill [Lords] have been presented by the Hertfordshire and Middlesex County Councils in respect to the Uxbridge Valley Water Order ; and by the Cranbrook District Water Company in respect of the Mid Kent Water Order. The Great Eastern Railway Company and the Great Yarmouth Corporation have petitioned against the Great Yarmouth Water-Works and Lowestoft Water and Gas Bill.

PONTEFRACT CORPORATION BILL.

House of Lords Committee.—Monday, July 9.

(*Before Lord* CLIFFORD OF CHUDLEIGH, *Chairman, Lord* COLCHESTER, *Lord* WYNFORD, *Lord* RITCHIE, *and Lord* SANDERSON.)

This Bill, which was before the Committee on the 5th and 6th inst. (*ante*, p. 114), was further considered to-day.

Mr. *Taylor* gave additional evidence, and said the Gas Company had always carried the interest from the reserve fund to the credit of the gas undertaking. The price of gas had been reduced from 3s. to 2s. 11d. per 1000 cubic feet. In 1895 and up to the year 1900, it was 2s. 10d. ; from 1900 to 1902, 3s. 1d. ; from 1903 to 1904, 3s. ; and in 1905, 2s. 11d. The charge for gas fluctuated according to the price of coal. A new Manager had been appointed who had carried out his duties very satisfactorily. Last year the profits amounted to £2788. The future prosperity of the Company was assured, and the concern was in a condition to meet all its obligations. About five years ago, the Pontefract Workhouse was one of the largest consumers ; but the Guardians had since resorted to electric lighting, which had reduced their consumption very much. The Company could not go to the reserve fund for money for ordinary purposes, but they could for extraordinary ones. With regard to the laying of mains, they would have to get what money they required upon mortgage, as they had power to raise more in this way.

Mr. *Garside*, an architect and surveyor, and a member of the Corporation, said he had never heard any complaints that the Company were backward about supplying gas to property. In his opinion, the Corporation had at present so many matters to attend to, which were of more importance than the gas undertaking, that the time was inopportune for the transfer of it to be made to them.

Mr. *L. V. Whitaker*, the Company's new Manager, said the works were fairly well equipped, and if, as was stated by the promoters, they were over-equipped, it was only an error on the right side. The Company had had occasion to use a large number of their retorts. It was necessary that gas-works should have a surplus ; and he did not think the number was too large, in face of the increased business that was being done. There were about 450 slot meters in use ; and they were hoping to be able to keep on adding to the number. With regard to the alleged extravagance on the part of the Company in the purchase of more land on which to erect a gasholder, when they already had some land in their possession, that land was liable to be flooded by water, and was therefore quite unsuitable for having a gasholder placed on it. As to the recovery of ammonia, in order to save the loss of a few pounds, it was necessary to put down a plant which would cost £300. There had been no complaints, so far as he knew, about the quality of the gas ; and there had been no difficulty in supplying it for public lighting.

Mr. *H. Gondell*, who assists in the management of the works, stated that during the past twenty years he had known of no instance where the extension of a gas-main had been refused ; and he had also had no complaints as to the quality of the gas. As a matter of fact, the gas was always 18-candle power when the Act of Parliament only required it to be 14-candle. There had never been any friction between the Corporation and the Company with regard to breaking up the streets.

Mr. *Corbet Woodall* was the last witness called for the Company. He said he knew of no instance where a gas company who had gone to Parliament for further powers and privileges had been dispossessed of their undertaking by a corporation. He drew a distinction between a non-statutory company who had been granted powers by Parliament being dispossessed by a local authority, and a company who had no such powers, but who were coming there for the first time, being subjected to a purchase clause. Where a statutory company were coming to Parliament after having exhausted their original grant, it was unusual for the local authority to step in and ask for a purchase clause; and he knew of only one instance where that had happened to a company against their will. There were, however, a great number of cases where a company coming to Parliament had been approached by the local authority, and the result had been an agreement for transfer. He thought it was a rare testimony to the character of the Pontefract Company that the criticisms (with all respect to Mr. Stevenson) had been so trivial. He had had the capital expenditure of gas companies in Yorkshire taken out, and found that it was £847 per million cubic feet of gas, which was only £1 less than that of the Pontefract Company. The price of gas in the town was less than in any other in Yorkshire doing the same amount of business. Touching upon the criticism that the Company had too many retorts, he said that they certainly had more than were needed for the present output of gas; but at one time there were extensions made in consequence of the rapid increase in the population. The business was growing very satisfactorily; and they had good reason to believe that it would continue. It was during the growing period that the increases were made; but there was a diminution in the consumption of gas for two years. The surplus land was used for grazing purposes, and brought in something like £8 a year. He did not think the transfer would be made at any great advantage to the consumer; and if the undertaking were purchased by the Corporation, the sum to be paid would be a very considerable one. Asked if he thought that making a precedent in this matter would have any effect on the management of gas companies in the future, witness replied that he felt very strongly indeed upon the point; and this was the chief reason why he was there. He thought that to establish a system of transferring gas undertakings upon the application of a local authority, without any sufficient reason, would be most injurious. A local authority never cared to acquire an undertaking which was not a prosperous one; and if the system to which he had referred were introduced, there would be little inducement to gas companies to place their undertakings in a really prosperous condition. If the company were agreeable, he had no objection; but if they were not, and they were doing satisfactory work, he considered it would be a pity to introduce such a system, and it would have an injurious effect.

In reply to Mr. WEDDERBURN, witness said he had always resisted compulsory transfer. He drew a distinction between a statutory and a non-statutory company, and he felt that it was a hardship upon one of the latter to be transferred simply because it was in that class.

Mr. WEDDERBURN pointed out, by means of a print of evidence taken at an earlier date, that witness had expressed a different opinion on the matter; but Mr. Woodall remarked that he had qualified his view since that time. It was constantly said that a non-statutory company was of less value than a statutory one; but, as a matter of fact, it was often of more value. It was with regard to this particular aspect of the transfer that he had qualified his view. Counsel remarked that at Accrington, in 1893, witness had said that there was not a single transfer which had not turned out satisfactorily. In reply to this, Mr. Woodall said that at that time the statement was quite correct. It was difficult to say how far they were satisfactory, because in each case there was some criticism as to the price which might be charged. Answering a remark made by Counsel with reference to the Corporation being responsible to both ratepayer and consumer, witness said a difficulty arose where the price of gas was increased in order to make a profit. The consumer and the ratepayer were not the same, because very often ratepayers were not consumers, and then, where a large proportion of gas was used by a manufacturer, he would have to pay doubly in relief of the rates. He (witness) believed the present Company would have to come to Parliament in four years at the outside. The prepayment meter system was on the increase, and if they got a larger business they would want more capital; and if they operated to keep away from Parliament, they would be subject to being censured. He considered that a capital expenditure of £848 per million cubic feet of gas was not unreasonable, though it was rather high.

Mr. WEDDERBURN: What do you say would be a fair sum for the relation of interest on capital to the quantity of gas produced. Supposing you are paying £3000 away in interest, and producing a certain quantity of gas, what ought the relation to be?

Witness: About 1s. per 1000 cubic feet or a little over.

Replying to another question, witness said that in the case of a non-statutory company the local authority still had powers under the Public Health Act, and their jurisdiction as a lighting authority was not ousted unless there was a statutory company within the area.

Tuesday, July 10.

On the resumption of the inquiry to-day,

Mr. FORBES LANKESTER addressed the Committee on behalf of the petitioners. He said it was the duty of the local authority of a town to see that the place was properly lighted, and if the non-statutory company failed to do their duty, the authority could intervene and supply gas. As soon as a company came to Parliament and asked to be allowed to withstand not only any other company but the local authority, and have conferred upon them a monopoly, a new condition of things arose. When an Act was obtained by a non-statutory company, it constituted a contract made in the presence of Parliament between the local authority, who represented the consumers and the ratepayers, and the gas company; and so long as there was no deliberate refusal to do something they ought to do, he ventured to think that Parliament would never step in and say that the contract must be wiped out, and a new one introduced. If it could be shown in any case that, in order to avoid the further modification of their contract by Parliament, a company had deliberately refused to extend their mains so as to give the proper pressure of gas, or had spent money in such a way as to keep away from Parliament as long as possible, then it would be different. But in the present case the works had lasted longer than was expected, because the population had not grown very rapidly, and the increase in the business had not realized the Company's expectations.

The CHAIRMAN remarked that a non-statutory company was liable to be ousted at any moment by the local authority, whereas a statutory company, by virtue of the statute which created it, ousted the power of the authority. The point was that the terms given to the statutory company by Parliament were calculated so that, in the ordinary course of events, the company would come to Parliament in a certain number of years. It seemed to him that, after a particular period, the local authority had a right to ask Parliament for a revision of those terms, and the restoration to them of the powers taken away. He asked Mr. Lankester if he could give the Committee a case bearing upon this point.

Mr. LANKESTER replied that he did not think there was such a precedent. Continuing, he said Parliament did not put upon companies any definite term of years, but considered the period over which their capital, if properly and fairly used, would last; and unless it could be said that the capital had been employed in some unfair way, so as to obviate the necessity for coming to Parliament, the period extended until the capital was fairly and reasonably exhausted. He did not think they would find any principle which could be put in the form of a term of years. When a statutory gas company came to Parliament for powers, they expected to get them, even if they were opposed by a corporation. With reference to the complaints as to the quality of the gas, not a word was heard until the Mayor of Pontefract gave evidence before the Committee. Among the items of extravagance of which Mr. Stevenson had complained, was that in the Board-room was hung the coat-of-arms of the town; but it was found that this had been presented to the Company. His further evidence, that the window-sills of the place were carved, turned out to be that the carving was merely plaster; and as regarded the reference to oak panelling, it happened that the "oak" was deal. If the Corporation could get the undertaking of the Gas Company cheap, and make it a profitable concern for the ratepayers, they would like to have it; but it must be remembered that the ratepayers would have to pay a very large sum indeed. If the Committee passed the Bill, they would be making a new precedent and would say that the mere desire on the part of a corporation to municipalize, should be sufficient to dispossess a gas company of their undertaking. The Corporation had a large amount of money to lay out to meet all the requirements of the town, and on the water undertaking alone would have to spend a considerable sum in order to put it in a satisfactory condition. In the other House, the Chairman of the Committee remarked that the local government of the town did not seem to have been what it might have been; and the Committee would not even entrust them with looking after a few cowsheds—much less with the expenditure of a large amount. There had been no desire on the part of the shareholders to sell their undertaking, and there had been no real complaint against them. He would ask the Committee, in the interest of the Corporation, and in view of the past history of that body, not to make a new departure, and take the undertaking from the Gas Company against their will.

Mr. WEDDERBURN then addressed the Committee. He said it had been stated that there was no instance in which such an action as the one for which the promoters of the Bill were asking, had ever taken place; but there was the case of St. Anne's-on-the-Sea. On the question of precedent, one had to see whether the Committee had all the facts before them, and whether, having all the facts, they could reasonably come to the decision for which the promoters of the Bill were asking. He had not the faintest doubt that if the Bill was passed, both Mr. Stevenson and Mr. Woodall would be capable of appearing before any Committee in another year and saying that, while taking Pontefract as a precedent, they must look into all the facts of the case. Mr. Lankester was inaccurate when he said that a non-statutory company were liable to be ousted by the local authority.

The CHAIRMAN: I think he said it was liable to be competed with.

Mr. WEDDERBURN said that, as he understood it, the practice of Parliament and the Local Government Board, if an application was made to them under the Public Health Act, was to insist upon any non-statutory company in the area being bought out. He did not think that anybody making an application in an area already occupied by a non-statutory company who were doing their duty, would find that either Parliament or the Local Government Board would decline to protect the company. When a local authority established gas-works, they applied to the Local Government Board for a loan. The Board would consider how to be fair to the company; and the practice had always been both for Parliament and the Board to insist, on the question of loans, upon the protection of the non-statutory company. On the question of transfer, they must consider the customer; and last year one-fourth of the money made by the Pontefract Company was paid by the Corporation. The Company were now paying £3000 away in dividends; and if the Corporation were to stand in the Company's shoes, they would pay a sum equal to £3000 a year. One had to pay it in the form of dividend, and the other in the form of sinking fund and interest. On the question of complaints, Mr. Lankester had said that they were manufactured in London, and were pure invention from beginning to end. But all the complaints, with the exception of those relating to the quality and pressure of gas, he (Mr. Wedderburn) had put before the Committee of the House of Commons. The capital expended per million cubic feet of gas sold ought, in the last ten years, to have decreased instead of having increased. Mr. Stevenson had said that he hardly knew a single instance of a gas company which had been reasonably conducted that had not had a ratio of increase in the course of the past twenty years. But during the last ten years the increase in the capital expenditure of the Pontefract Company had been at the rate of 5 per cent.; and in the last five years, at the rate of 1 per cent. The policy of Parliament in these matters had been in favour of transfer; and it could be done in the case of Pontefract without the slightest injury to the Company.

The Committee decided that the Bill might proceed.

Wednesday, July 11.

Objections and amendments to the clauses of the Bill were dealt with to-day.

Mr. LANKESTER drew attention to clause 26, which provided that "The Company shall sell to the Corporation, and the Corporation shall purchase, the undertaking of the Company free from any encumbrances." The modern practice, he said, was not to deal with it in this way, but to sell the undertaking subject to all then existing mortgages, obligations, and liabilities.

Mr. WEDDERBURN said that the promoters ought to take over the undertaking as a going concern. He accepted the clause as Mr. Lankester had altered it. As it stood in the Bill, the clause read as follows :—

If within three months after the passing of this Act the Corporation shall give to the Company notice in writing of their intention to purchase the undertaking of the Company, the Company shall sell to the Corporation and the Corporation shall purchase the undertaking of the Company, free from encumbrances, for such price or consideration being a sum in gross and on and subject to such terms and conditions as may be agreed upon between the Company and the Corporation, or, as failing agreement, shall be determined by the arbitration of a single Arbitrator under and pursuant to the provisions of the Lands Clauses Act, such Arbitrator to be agreed upon by the Company and the Corporation, or, failing such agreement, to be appointed by the Board of Trade upon the application of either party, and in the construction of those Acts for the purposes of this section the Corporation shall be deemed to be "the promoters of the undertaking," and the undertaking of the Company shall be deemed to be "lands taken or required for the undertaking." Provided that, in the event of arbitration, neither party shall be represented by more than one Counsel or be at liberty to call before the Arbitrator more than one engineer and one accountant as expert witnesses, in addition to any officers in the regular employment of the parties respectively.

Mr. LANKESTER said he understood that they had accepted the arbitration of a single Arbitrator; but they had rather reconsidered the position, and they did not see any reason why they should depart from the usual form in the matter. They preferred to leave it generally to the Lands Clauses Acts, and to arbitration provided for in the Acts. He believed that under these Acts they could agree to one Arbitrator; but if not, each side appointed an Arbitrator, who appointed an Umpire.

Mr. WEDDERBURN took objection, on the ground that he had had no notice of the amendment. The object had been economy; and they did not see why a single Arbitrator should not be as good as a single Umpire.

Mr. LANKESTER said he understood that Mr. Woodall was not willing in future to be called as a witness in arbitration cases; and therefore, unless they could have him representing them as Arbitrator, they would lose his services altogether.

The CHAIRMAN: I think we can only adopt one course, and that is to go back to the Lands Clauses Consolidation Act in the absence of any agreement between the parties.

Mr. LANKESTER said that Mr. Wedderburn had admitted that if there was a compulsory purchase, and they were unwilling sellers, the usual allowance was 10 per cent. It was a compulsory purchase; and as they had been beaten, they desired to be treated as persons who were being bought against their will.

The Committee decided to leave the matter entirely in the hands of the Arbitrator, and give no expression of opinion, one way or the other.

Mr. LANKESTER next proposed that "The Corporation shall also pay compensation to any officers and servants."

Mr. WEDDERBURN agreed, in principle, that they ought to compensate the Manager and Secretary if they were not ready to take them on; and therefore the way in which he proposed to meet the case was: "The Corporation shall also pay compensation to the Manager and the Secretary of the Company, or either of them, if the Corporation shall not be willing to retain them, or either of them, in the same or a similar office."

Mr. LANKESTER: I say officers and servants and every regular employee of the Company.

Mr. WEDDERBURN: Then I think we shall have the words "If the Corporation are not willing to retain them, or any of them."

Mr. LANKESTER next moved the compensation of the Directors; but the Committee decided that they could not extend compensation to them.

Mr. LANKESTER then suggested the following amendment :—

The expression "the undertaking of the Company" includes all the gas-works, engines, mains, pipes, and machinery, lands and buildings, plant fixed and movable, and all other the real and personal property, assets, and effects of whatever nature, and all the rights, powers, and privileges vested in, or belonging to, or had or enjoyed by, the Company at the date of the transfer of the undertaking of the Company to the Corporation, except the cash in hand or with their bankers, or book debts received or due on credit or revenue account, and except any profits then to be divided, and except the books and papers relating exclusively to the shareholders in, and the constitution of, the Company, and also movable stock-in-trade, gas, coal, and other stores.

Mr. WEDDERBURN objected to the words "except cash in hand or with their bankers, or book debts received or due on credit or revenue account, and except any profits then to be divided and," which he asked to have struck out. If he was to take over the undertaking as a going concern, he must take it over with its liabilities and its mortgages on the one side; but he must take it over, on the other hand, with its cash in hand, with its balance at the bankers, with its book debts to be got in, and with its stock.

The CHAIRMAN, in the course of some discussion, put it to Mr. Lankester in this way: You have (say) a sum of £5000 at your bankers. You pay your shareholders 10 per cent. up to the date of the transfer, and retain that £5000. What do you do with it? If you pay it to your shareholders, you pay them more than 10 per cent.

Mr. LANKESTER said this was provided for in clauses 32 and 34.

Mr. WEDDERBURN: Those clauses will have to come out if this one is put in.

Mr. LANKESTER: The previous clause I brought up simply dealt with the question of mortgages.

Mr. WEDDERBURN: No; "and other liabilities and obligations." If your Lordship looks at clauses 8 and 14 in the Morley case, you will see the provisions as to dividend there.

Mr. LANKESTER: I am rather disposed to think your Lordship is right on the point you put to me; and perhaps the exception ought not to be made. I will leave it there.

Mr. WEDDERBURN said that this was all the contentious matter. They proposed to take out clause 31, because it was now dealt with in Mr. Lankester's amendment. Then they proposed to delete clause 32, as to the Company paying out-goings and being entitled to receipts till the time of transfer.

Mr. LANKESTER objected to any alteration in this respect.

Mr. WEDDERBURN said now that they had the words in that they were to pay the mortgages, obligations, and liabilities at their request, it would be inconsistent to have the clause saying that the Company should do the same thing.

Eventually the Chairman accepted Mr. Lankester's suggestion that the Bill should not be reported to the House until he had had an opportunity of considering as to whether this point was covered by the new clause 34. [The matter was not mentioned at the adjourned sitting, and therefore the clause comes out.]

Thursday, July 12.

The remaining amendments were brought up to-day, when

Mr. WEDDERBURN raised the question of what period should be allowed to the Corporation for the repayment of loans in respect of the purchase of the gas undertaking. The present period in the Bill was 45 years, which was allowed by the House of Commons after hearing Mr. Stevenson. When the matter came before the Lord Chairman, however, he thought that 45 years was too long, and suggested a reduction to 35 years. If 45 years was too long, they should make it 40 years.

The Committee agreed to allow a term of 40 years.

UNOPPOSED BILLS.

Lord ONSLOW, the Lord Chairman of Committees, last Tuesday dealt with a batch of Unopposed Bills.

Rochester, Chatham, and Strood Gas Bill.

By this Bill, which is entitled "A Bill to confer further powers on the Rochester, Chatham, and Strood Gas Company," power is taken to raise additional capital to the extent of £150,000, with the usual borrowing powers, and also to convert and consolidate the existing capital of the Company.

It was stated that the ordinary testing clause had been agreed with the Corporation.

The Bill was ordered to be reported, with amendments.

Watford Gas Bill.

The Watford Gas Bill proposes to consolidate the capital of the Watford Gas and Coke Company, to confer further powers on the Company with respect to the raising of additional capital, and to authorize the construction and maintenance of additional gas-works. The share capital provided for amounts to £180,000, with one-third borrowing powers.

The Bill was ordered to be reported, with amendments.

Ascot District Gas Bill.

This Bill provides for the changing of the name of the Ascot District Gas Company to that of the Ascot District Lighting and Power Company, for the extension of their limits of supply so as to incude Chobham, for the supply of electricity, and for the raising of capital for these purposes.

The Bill was ordered to be reported, with amendments.

Bacup Corporation Bill.

The objects of this Bill, which was also reported with amendments, are to extend the time limited by the Bacup Corporation Water Act, 1898, for the construction of water-works, to confer further powers upon the Mayor, Aldermen, and Burgesses of the Borough of Bacup in relation to their water and electricity undertakings, and to make further provision with regard to the health, local government, and improvement of the Borough.

Mr. CALDWELL, the Deputy-Chairman of Ways and Means, on Thursday presided over the Unopposed Bills Committee of the House of Commons, and dealt, among others, with the

Portsmouth Water Bill.

By the Bill as introduced, it was proposed to extend the limits of supply of the Portsmouth Water Company, to authorize the construction of additional works, and for other purposes. It was stated that the Bill was opposed before a Committee of the House of Lords by landowners objecting to the large extension of the area of supply which was proposed, and, the opposition being successful, a great deal of the original Bill (including the extension) had gone. This involved the reduction of the proposed capital from £225,000 share and £75,000 loan, to £99,000 share and £33,000 loan. Formal proofs were given by Mr. J. L. Wilkinson, the Secretary of the Company; and the Bill was ordered to be reported as amended.

New Joint-Stock Companies.—The Bedlington Gaslight Company, Limited, has been registered, with a capital of £5000, in £10 shares, to acquire the business of the Bedlington Gas Company, Northumberland, in liquidation. There will be no initial public issue. The Platico Mantle Company, Limited, has been registered with a capital of £4000, in £1 shares, to deal with certain British and other patents of Mr. J. P. Laycock relating to gas-mantles.

CORRESPONDENCE.

[We are not responsible for the opinions expressed by Correspondents.]

The Sutton Water Company's Bill.

SIR,—In your otherwise excellent report of the proceedings before the Committee of the House of Commons on this Bill, there is one somewhat important inaccuracy which I shall be much obliged if you will correct. You say there were some opponents, the principal being the London, Brighton, and South Coast Railway Company. The Railway Company were the only opponents. The following is a list of the petitions: In favour and against alterations—Croydon Corporation, Owners, &c., of mills and lands on the River Wandle. In favour—London County Council, Wandsworth Borough Council, Carshalton Urban District Council, Epsom Urban District Council, Sutton (Surrey) Urban District Council, Epsom Rural District Council, Ewell Parish Council and Owners, &c., on the River Hoggsmill, and Provincial Water Companies' Association. Against—London, Brighton, and South Coast Railway Company. It will be seen that the only opponents of the Bill are the perpetrators of the wrong against which the Bill is directed.

W. VAUX GRAHAM,
Consulting Engineer, Sutton District Water Company.

5, *Queen Anne's Gate, July* 13, 1906.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

(*Before Mr. Justice* BUCKLEY.)

Bourn v. Salmon and Gluckstein, Limited.

Levying of Water-Rates in Respect of Demised Premises.

This was a case bearing upon the rights of landlord and tenant. The Prudential Assurance Company are the owners of the block of buildings at the corner of Holborn and Gray's Inn Road. They leased it to another Company, who leased a part to Messrs. Salmon and Gluckstein, who, in their turn, sub-leased a portion to Messrs. Bourn. The Metropolitan Water Board levied their rate on the head lessees, who paid, and ultimately applied to the defendants; the latter demanding the portion of the rate from their tenants. The question was whether Messrs. Salmon and Gluckstein had any right against their sub-lessees.

Justice BUCKLEY, in giving judgment, pointed out that the question was whether a water-rate was a rate payable in respect of demised premises. If he were at liberty to use his own judgment, he would say it was not. A water-rate was not payable in respect of the premises in the sense that the owner of the premises must pay; it was payable in respect of water which the occupier requested to have supplied. He might ask for it or he might not. If he asked for it, he paid; if he did not ask, he did not pay. But he (his Lordship) felt that he was bound by authority to hold the contrary; a Divisional Court having decided that a water-rate was a rate. He must say, therefore, that a water-rate was a rate within the meaning of the covenant to pay rates and taxes; but he hoped the matter would be taken to the Court of Appeal.

The Action against the Portsea Island Gas Company.

In the Chancery Division of the High Court of Justice on Thursday, the case of *Tottenham and Broadway v. Portsea Island Gas Company*, which has been several times referred to in the "JOURNAL," was down for hearing before Mr. Justice Neville. When it was called on, however, Mr. Jenkins, K.C., who (with Mr. Tyrrell) appeared for the plaintiffs, informed his Lordship that the parties had come to terms. He said it was not necessary for him to state specifically what they were, but the defendants would submit to certain injunctions which had already been the subject of undertakings on motion. There would be judgment for the plaintiffs for a certain amount, with costs of the action, including those which had been reserved. A sum of £150 had been paid into Court; and this would be handed over to the plaintiffs on account of the judgment, which was for a larger sum. This was the whole matter between plaintiffs and defendants; but he desired, if it could be done, to reserve liberty to apply as between the two plaintiffs. The money payable by the defendants would be paid over to the plaintiffs, one of whom was landlord and the other tenant. It was doubtful who was the right plaintiff to receive the money. Defendants had nothing to do with this. Unless the plaintiffs could agree, the point would have to be decided somehow, and it could be done under this judgment if liberty to apply was reserved. His Lordship doubted whether he had any jurisdiction in the matter. Mr. Jenkins said he had not, unless by consent as arbitrator. He should think the plaintiffs would agree; but he felt a little doubt. His Lordship said if the parties liked to take it in that way, he would be happy to act as Arbitrator; but it must be understood that he acted only in that capacity. Mr. Jenkins said the parties would certainly agree to that. Mr. Russell, who, with Mr. Danckwerts, K.C., appeared for the defendants (instructed by Messrs. Monier-Williams and Robinson), hoped it would be made clear that this was not done at their expense. Mr. Jenkins assented; and the action terminated on this understanding.

Circulars have been issued to the colliery proprietors notifying the intention of the principal Railway Companies to charge them siding-rent after three clear days' occupation. This intimation is causing much dissatisfaction. The siding-rent is 6d. per truck per day.

MISCELLANEOUS NEWS.

SULPHATE OF AMMONIA COMMITTEE.

Annual Report.

The Annual Meeting of the Subscribers was held at the Office, No. 4, Fenchurch Avenue, E.C., last Thursday. The following are extracts from the report submitted by the Committee.

During 1905, 93 competitions were organized for the Committee's prizes. The decrease in numbers as compared with preceding years is caused by the Committee's endeavour to prevent the overlapping of the districts of Agricultural Societies which formerly occurred.

Sulphate of ammonia was again advertised in the chief organs of the agricultural press during the recent manuring season. Pamphlets prepared for the use of farmers, market gardeners, horticulturists, &c., have just been issued It is proposed to circulate these pamphlets through the medium of the principal agricultural merchants and dealers, nurserymen, seedsmen, &c , throughout the country, a large number of whom have already expressed their willingness to distribute the publications among their customers and friends.

This season a series of experiments is being conducted in Glamorganshire under the auspices of the Glamorganshire Chamber of Agriculture, in which plots of potatoes, roots, barley, wheat, grass, &c., grown with the aid of sulphate of ammonia in conjunction with potash and superphosphate, are being tested against adjoining plots of similar produce, in which equivalent quantities of nitrogen from other sources have been substituted for sulphate of ammonia.

The Committee having decided that it would be advantageous to get into more direct communication with the actual users of sulphate of ammonia, in order to further explain its advantages, have appointed an experienced man to attend provincial markets and shows, and to call upon agricultural merchants and dealers. Although but a short time has elapsed since the new appointment was made, the Committee are highly satisfied with the progress already made. A stand has been placed at several of the important agricultural shows. Decorated tins (chiefly as an advertisement), containing each 3 lbs. of sulphate of ammonia, will be distributed among local dealers, many of whom are having the words "Sulphate of Ammonia and Other Manures" placed on their shop windows at the Committee's expense, and large numbers of post-cards bearing a reference to sulphate of ammonia are being distributed for use by agricultural dealers in the Provinces.

The Committee's efforts to secure new subscribers during the past year have been maintained, and have been attended with a considerable measure of success. Although numerically the additions are slightly fewer than they were last year, their importance, from the point of view of production, is very much greater.

In all, 25 new members were enrolled, as against 31 in the preceding year. Among the new members are, however, some of the most important iron and coke-oven undertakings in the kingdom.

Subscribers to the Committee now represent about 153,000 tons of sulphate of ammonia per annum. The Committee would here urge on all members the importance of obtaining new subscribers in their own particular districts. The production of sulphate of ammonia is increasing considerably; and it is therefore most essential that funds should be provided for increased efforts on the part of the Committee to further popularize the use of this excellent fertilizer in this country.

The Committee regret to announce the death of Mr. Robert Orr, of Messrs. James Ross and Co , Falkirk, who shortly before that event had, on account of failing health, tendered his resignation in favour of Mr. R. M. Sutherland of the same firm. The Committee also regret to announce that Mr. Alderman Gibson, representing the Manchester Corporation Gas Department, has tendered his resignation on account of ill-health. Mr. Alderman Briggs, J.P., has been elected in Mr. Alderman Gibson's place.

THE YEAR'S WORKING AT MANCHESTER.

A Good Increase in Consumption.

Last Wednesday, the Manchester Gas Committee held a special meeting to consider the report and accounts for the year to March 31, copies of which we have since received from the Superintendent, Mr. Charles Nickson.

The quantity of coal and cannel carbonized (including the equivalents of enriching materials) was 484,249 tons, as compared with 456,710 tons in the previous year; the quantity of gas made per ton being 10,976 cubic feet, against 10,967 feet. The quantity of gas sent out from the works (5,319,835,000 cubic feet) shows an increase of 321,379,000 feet, or 6·43 per cent., as compared with an increase of 4,220,000 feet, or 0·08 per cent., in the preceding year. The quantity of carburetted water gas produced during the year was 1,194,041,000 cubic feet, as compared with 1,110,866,000 cubic feet the previous year. In the production of this gas, 3,531,282 gallons of oil and 22,917 tons coke were used, as against 3,415,294 gallons and 21,275 tons respectively for the year ending March, 1905. The illuminating power of the gas sent from the works, as tested by the flat-flame burner, was equivalent to 15·30 standard sperm candles, as against 17·04 candles. The unaccounted-for gas was 3·20 per cent., which compares with 2·88 per cent. for the previous year.

The number of consumers on March 31 was 160,113, of whom 19,389 were outside the city. The previous year the number was 152,165, of whom 18,087 were outside the city. The total increase was thus 7948. Of the total consumers, 52,006 use prepayment meters. This compares with 47,865 in the previous year—an increase of 4141; and of this

increase 3553 have been fixed in the city and 588 in out-townships. The quantity of gas passed by these meters was 426,832,000 feet, or an increase of 37,923,000 feet, or 9·75 per cent., on the previous year. The meters have been inspected once in every five weeks; and the amount collected during the year was £59,778 12s. 2d. This is represented by 14,346,866 pennies, weighing 128 tons 1 cwt. 3 qrs. 21 lbs. The number of gas-cookers and other appliances fixed at March 31 was 29,760, compared with 23,862 for the year ending March, 1905. The total quantity of gas that was consumed by cookers is estimated at 426,000,000 cubic feet; being an increase of 76,000,000 feet, or 21·71 per cent., on last year's figures. There have also been fixed 26,186 grillers in connection with prepayment and small ordinary meters. About 35 per cent. of the consumers now have the free use of a cooker or griller. On March 31 last the number of gas-engines in use was 1775, as compared with 1711 in the previous year. The quantity of gas consumed by these engines was 414,089,000 cubic feet, an increase of 27,107,000 feet, or 7 per cent. In accordance with the resolution passed by the City Council in May, 1905, the price of gas to ordinary consumers was reduced from 2s. 4d. to 2s. 3d. per 1000 cubic feet within the city, and from 2s. 7d. to 2s. 6d. without the city, as from June 24 of that year. The cost of coal, cannel, and oil per ton carbonized was 10s. 4·74d., as against 10s. 8·85d. for the previous year, a reduction of 4·11d. per ton, which on the total carbonization of 484,249 tons amounts to £8293.

The total income was £699,566, and the expenditure £566,692. The gross profit on the year's working was £132,874. The sum of £42,870 was paid for interest on loans, &c. The net profit therefore amounted to £90,004. This sum, together with £28,976 transferred from reserve —making together £118,980—has been appropriated as follows: To the sinking fund for redemption of loans, £49,413; paid over to city fund, £50,385; extension of carburetted water-gas plant, £1175; extension of Whitworth Street West depôt, £8302; purchase of consolidated 4 per cent. stock for cancellation, £9704. The amount of £50,710 paid for the purchase of the rights and property of the Stretford Gas Company within the township of Chorlton-cum-Hardy was taken from the reserve fund, and the supply of gas transferred on March 26 last. In accordance with the resolution passed by the City Council in October, the expenses of the Royal visit, amounting to £8898, were also defrayed out of the reserve fund.

During the year the reconstruction of one-half of the No. 2 retort-house at the Gaythorn station (containing eighteen beds of inclined retorts) was carried out; and the result has been a considerable reduction in the carbonizing costs of this station. Various other alterations and extensions at the different works have also been taken in hand. The total length of mains now laid is 1,548,781 yards, or 879¾ miles and 421 yards; being an increase of 21½ miles and 278 yards during the year. The number of public lamps within the city is 17,831, and outside the city 2119—a total of 19,950, of which 9143 within the city are fitted with 15,405 incandescent burners.

The following are the principal items in the accounts:—

REVENUE ACCOUNT.

INCOME.

Gas-rental—						
Ordinary meters					£478,128	12 7
Prepayment meters					59,778	12 2
Public lamps					44,686	1 2
Residual products—						
Coke	£56,316	12	8			
Tar	23,507	2	11			
Sulphate of ammonia	36,439	10	8			
Carbon	186	14	2			
				116,450	0	5
Rents of cottages, &c.				523	6	4
				£699,566	12	8

EXPENDITURE.

Manufacture—						
Cannel, coal, and oil (including cost of unloading, &c.)	£251,699	2	6			
Coke, water, &c. (carburetted water gas)	8,142	17	1			
Carbonization (wages)	44,384	4	1			
Purification (less sales of spent material, £4555 3s. 11d.)	3,114	15	8			
Retorts, fire-bricks, &c.	10,497	3	3			
Repairs and maintenance of works, &c.	46,200	4	4			
Salaries of Engineer and works staff (less proportion transferred, £1668 16s. 8d.)	5,220	8	6			
	369,258	15	5			
Provision for renewal of works plant	21,199	0	0			
				£390,457	15	5
Distribution—						
Repair and maintenance of mains, services, meters, and stoves	31,250	6	2			
Salaries (less proportion transferred, £519 5s. 0d.)	28,426	9	5			
	59,676	15	7			
Provision for renewal of distribution plant	38,052	0	0			
				97,728	15	7
Rents, rates, and taxes				56,398	7	1
Management—						
Salaries	14,008	3	5			
General charges	5,069	12	6			
				19,077	15	11
Law and parliamentary charges				281	2	1
Subscriptions and donations				1,826	9	10
Bad debts				922	5	6
				566,692	11	5
Balance carried to profit and loss account				132,874	1	3
				£699,566	12	8

The accounts are followed by the usual appendices, furnishing particulars in regard to the progress of the undertaking.

Appendix A is a comparative statement of the gas transmitted from the works in the daytime and during the twenty-four hours, for the past two years. Summarized, the figures are as follows:—

	Daytime. Cubic Feet.	Twenty-four Hours. Cubic Feet.
Year ended March 31, 1906	1,670,277,000	5,319,835,000
Do. Do. 1905	1,562,986,000	4,998,456,000
Increase	107,291,000	321,379,000

	Cubic Feet.
Gas transmitted from the works	5,319,835,000
Do. accounted for	5,149,585,000
Loss (by condensation and leakage)	170,250,000 or 3·20 per cent.

In Appendix B, particulars are given as to the results of the working from March 31, 1887, to March 31, 1906. The table contains statistics as to the number of tons of coal and cannel carbonized, the total make of gas, the percentage unaccounted for, the yield per ton of coal, the illuminating power of the gas, the quantity of residual products, &c., each year in the above-mentioned period. The particulars for the past financial year are as follows: Coal and cannel carbonized, 484,249 tons; gas made, 5,315,263,000 cubic feet; yield per ton of coal carbonized, 10,976 cubic feet; illuminating power (by flat-flame burner), 15·30 candles; quantity sold, 5,045,285,000 cubic feet; quantity sold per ton, 10,419 cubic feet; percentage of output unaccounted for, 3·20; coke for sale, 176,390 tons; do. per ton of coal, 9·39 cwt.; make of tar, 25,740 tons; do. per ton of coal, 11·41 gallons; ammoniacal liquor (10-oz. strength) made, 11,148,744 gallons; do. per ton of coal, 29·70 gallons; sulphate made, 3986 tons; do. per ton of coal, 25·34 lbs.

Appendix C shows the number of stoves and of each size of meter in use during the year in the city and out-townships. At the close of the past financial year, there were 25,078 stoves on hire within, and 4682 beyond, the city—together 29,760, compared with 20,117 and 3745 (together, 23,862) at the corresponding date in 1905; so that there was an increase of 5898. The number of meters in use was 160,113 in 1906 and 152,165 in 1905. There was last year a net increase of 7948 on the number for the preceding year. The number of prepayment meters in use on March 31 last was 52,006—an increase of 4141 on the number at the close of the preceding year.

From Appendix D, we learn that the gas-mains laid last year within the city extended to 26,858 yards, and beyond the city to 12,691 yards —being 22¾ miles and 389 yards. The mains taken up were 12,042 and 4228 yards respectively—a total of 16,270 yards, or 9 miles and 430 yards. The total net increase during the year, therefore, was 23,279 yards, or 13 miles and 399 yards. The total length of mains at March, including those lately purchased from the Stretford Gas Company, was 1,548,781 yards, or 879¾ miles and 421 yards.

Appendix E is an abstract of the capital, revenue, and profit and loss accounts. It shows (*inter alia*) the amount of gross profit made from the gas undertaking, and the mode of its appropriation, also the amount of borrowed money owing, excess of assets, &c., from March 31, 1886, to March 31 last. The figures for the past financial year are as follows: Gross profit, £135,433; net profit, £91,337; contributed to sinking fund for redemption of debt, £50,747; paid over for improvement purposes and city fund, £59,282; applied in extension of works, £69,892; borrowed money owing, £1,223,765; and excess of assets, £1,473,549. From June 24, 1843, the date when the works were taken over by the Corporation from the Commissioners of Police, the gross profits on the gas undertaking have amounted to £5,585,658, out of which £1,318,119 has been paid for interest; leaving the net profit, £4,267,539. Of this total, £1,290,394 has been placed to the sinking fund; £2,419,383 has been handed over to the Improvement Committee and added to the city fund, £329,201 has been paid for street lighting (making £2,748,584 used in relief of the rates), and £170,639 applied in the extension of works.

SALFORD CORPORATION GAS UNDERTAKING.

The Past Year's Working.

The report of the Gas Committee of the Salford Corporation for the year ending the 31st of March last has been issued. It opens with the gratifying statement that there was a considerable increase in the number of consumers during the year; and that the sales of gas showed an increase equal to 3·6 per cent. The new show-rooms were opened in January, and consumers have to a large extent availed themselves of the opportunities afforded to inspect the latest designs in gas appliances for cooking, heating, and trade purposes. The works and plant, under the supervision of Mr. W. W. Woodward, the Engineer and Manager, have been maintained in a thoroughly efficient condition. The new installation of stoking machinery and coke-handling plant for the Liverpool Street retort-house was put into operation in October last, and is working most satisfactorily. The coal and cannel carbonized during the year amounted to 158,217 tons, and the quantity of gas made was 1,604,974,000 cubic feet, of an average illuminating power equal to 19·45 standard candles; the parliamentary standard being 18 candles within the borough, and 17 candles in the out-districts.

The accounts accompanying the report show that the sale of gas produced £167,682; the rental of stoves, £2200; the sale of residuals, £50,281; and rents, £498—making a total of £220,661. The following are the principal items of expenditure: Manufacture of gas, £114,670; distribution, £13,334; rents, rates, and taxes, £14,796; management, £6203. The total expenses (including £623 for bad debts written off) amounted to £151,502; leaving a balance of £69,159 to go to the profit and loss account. The total standing to the credit of this account at the close of the year was £71,078; but it was subject to the payment of interest and the contributions to the gas and borough redemption funds, and £9500 was written off for depreciation. So that the net profit for the year was £23,936, which was transferred to the district fund account.

CARLISLE GAS AND WATER PROFITS.

At their Monthly Meeting last Tuesday, the Carlisle Town Council had before them the annual accounts relating to the gas and water undertaking.

Mr. COULTHARD, who moved the adoption of the accounts, said that on the whole he considered them satisfactory—showing, as they did, a net balance on the gas and water of £14,606, or an increase on the two concerns of £674 over the previous year. The gas profits showed a decrease of £563; and the private rental was reduced by £956. The loss on tar as against last year was £336; but the sale of coke showed an increase of £394, and sulphate of ammonia £58 increase. The bye-products thus showed a net increase of £116. The reduction of £956 in the private rental might be accounted for by the fact that they had lost some of their largest consumers, including some of the railway companies, who had gone in for electric light and had put down their own plant. They would lose another large consumer this year—the asylum, whose account was from £400 to £450 per annum. The Asylum Committee, as the Council would be aware, were putting down an electric lighting plant of their own. The incandescent burners had also done a good deal in reducing the consumption, as they required much less gas than the ordinary burners, and they had a good many of them in use now. The only way that he could see to keep up the private consumption would be to reduce the price of gas by 2d. per 1000 cubic feet. They had the plant which would be necessary to make another 100 million cubic feet of gas; and if by reducing the price 2d. per 1000 feet they could increase the consumption to the extent of 100 million cubic feet, the profits would be the same as to-day, assuming that coal and oil remained at the present price. No doubt such reduction would largely increase the sale of gas; and the ratepayers would be relieved by 2d. per 1000 feet. The Council would observe a rather heavy item in the accounts—namely, the deficiency for cookers hired out. This deficiency was £590; and it seemed a large sum. It was the first time a deficiency in cookers had been shown in this way in the accounts. The deficiency in former years must have been put under some other head of expenditure, as they had always had a depreciation on the cooker account ever since cookers were introduced. He thought this account in future should go further, and show what the net working results were after giving the deficiency; for to look at the account as it stood, they might take it for a dead-loss. He would explain this deficiency in the best way he could. During the past year 69 old cookers had been broken up. Valued, as they were, at £2 10s. each, this would account for £176 of the £590. Further, all cookers had to be fitted up free of charge; material and men's time having to be found by the Corporation. When the cookers required cleaning, they had to be carted to the works and cleaned at the cost of the Corporation, and sent back and refitted free of charge. This cost a very considerable sum; and it all, of course, came under the head of deficiency. But though a loss of £590 was shown, the gas consumed by the cookers exhibited a balance of £310 in favour of the profits for the past year, besides paying off principal and interest on the capital borrowed upon the cookers; so they would see by this that the cookers brought in a fairly good revenue, and also helped the consumption of gas considerably. The rental of cookers was low; but some towns put them in free of any rental or charge. Some 230 new cookers were sent out last year; and of these 139 were for penny-in-the slot consumers. The accounts for the penny-in-the-slot cookers averaged £2 9s. 2d. per annum, which the Manager (Mr. W. J. Smith) considered very good. The prospects for the gas-works for the present year were not quite so bright as they were at the beginning of last year. Coal had gone up 3d. to 4d. per ton, which, if the quantity worked out the same as last year, would show a loss of from £300 to £400. Tar had again dropped in price, 3s. 6d. per ton. This would be another loss of £350 on the year's working. Three years or so ago tar was 34s. 6d. per ton, as against 16s. this year and 19s. 6d. last year. The water rental had done better during the past year, showing an increase of £1237 over the previous year. A large proportion of this increase in the account was due to the dropping of discount as from January of the present year. When speaking of water, he might say they expected that, on Aug. 16, Sir Benjamin Scott, as Chairman of the new water scheme, would have the pleasure of turning on the pure and unadultered springs from the valley of the Gelt. This work was their city's greatest achievement, and when completed would tend, he hoped, to improve its health. One other thing he hoped for, and that was that when the water scheme was completed, the city might not go in for any other great project, but return to their ordinary expenditure of some thirty or forty years ago. The present generation had done quite enough for the next quarter-of-a-century.

Mr. HURST seconded the motion.

Mr. NICHOLSON said he was glad the Gas Committee contemplated reducing the price of gas.

Mr. COULTHARD: We have not contemplated doing so yet. It is only a proposal.

Mr. NICHOLSON suggested that the Committee should reduce the price of gas to the prepayment consumers. The present cost, he said, pressed heavily on a certain section of the citizens.

Mr. WATSON advocated a reduction in the price of gas, the letting out of cookers free, as was done in other towns, and a provision that the largest share of the profits from gas should go to consumers.

Mr. WHITE said he would like to add his congratulations to the Chairman of the Committee and the Manager. They had proved by the balance-sheet that they had had a successful year's working. As to the suggestion made by Mr. Watson, that cookers should be hired out free, he hoped they would not forget the disastrous result of abolishing meter-rents. When that was carried out, they found they had made a huge mistake; and it would be just the same with regard to cookers, because there were a great many people in Carlisle who had bought their cookers. He had bought the one he used; and he did not pay any rent. If they abolished rents for cookers, they would have to deal with owners, as they had to do when meter-rents were abolished, and allow for the value of those which belonged to the citizens. He thought the letting out of cookers free would be a mistaken policy.

The accounts were adopted.

FENTON DISTRICT COUNCIL GAS DEPARTMENT.

The Past Year's Working.

According to the report of the Gas Committee of the Fenton Urban District Council for the year ending the 31st of March last, the make of gas was 87,262,000 cubic feet; being an increase of 2,119,000 cubic feet, or at the rate of 2·4 per cent., on the make in 1904-5. The unaccounted-for gas was 7·9 per cent.—an increase of 0·6 per cent. for the year. The gas-rentals account shows an increase of £229 14s. 7d. from private consumers, and £2 6s. 7d. from stove rents. A sum of £6 14s. more was received for residuals. The decreased cost of manufacture, repairs, and maintenance of works, &c.. was £468 5s.; and the decreased cost of distribution £40 19s. 2d. The increase in the rates and taxes was £21 15s. 9d. During the year, 159 new services for private lighting and 148 for gas cookers were laid; 496 prepayment meters were fixed and 336 brought in; and 81 ordinary meters fixed and 91 brought in—the total increased number of consumers being 150. The number of cookers fixed was 188, and 144 were brought in—an increase of 44 for the year. The net profits of £1927 17s. 8d. have been divided as follows: To loan No. 78 account, £1727 17s. 8d.; to reserve fund, £200. The working results for the year were as follows: The whole of the gas for the public lighting was supplied free of charge, equal to an amount of £1293 7s. 11d., or 4d. in the pound on the general district rate. The gross profits were £5928 9s. 6d., and after paying interest and instalments on loans there is a net profit of £2520 16s. 6d. for division. The result will doubtless be regarded as satisfactory by the Committee and their Engineer and Manager (Mr. R. Surtees).

GAS v. ELECTRICITY AT KIDDERMINSTER.

The Lighting of the Retail Market.

At a Meeting of the Kidderminster Town Council last Wednesday, the General Purposes Committee reported that they had had under consideration the question of the improvement in the lighting of the Retail Market; lights having been erected by the Kidderminster Gas Company and the Kidderminster and District Electric Lighting Company. They had been inspected by the Committee, who recommended the adoption of the electric light on the following terms, subject to a satisfactory arrangement being made with the Company as to the maximum annual cost of the light being arrived at: Electric current, £30 3s.; cost of installation, estimated at £157, to be paid by quarterly instalments of £9; maintenance of the installation, £6—making a total of £72 3s. per annum. The cost of lighting by gas for the year ending March 31 amounted to £73 4s. 10d.

The adoption of the report having been moved and seconded, Mr. Grosvenor said he did not think he had ever seen a statement put before the Council in a bolder form, or with fewer statistics or data, than that contained in the report. The position was this: The Gas Company tendered for an installation to cost £160, which was to be repaid by quarterly repayments of £8; and this charge included every cost of maintaining the installation in good working order. The way in which the Electric Lighting Company's tender was stated in the report was very misleading. The cost of the current was put at £30 3s. a year; but he believed if their letter were referred to it would be found the Company did not bind themselves to that. They said it was an approximate charge. The cost of the installation was estimated at £157, to be paid by quarterly instalments of £9 a quarter. Then they were going to charge £6 a year for keeping the installation in order, so that altogether the electric installation would cost £210, against £160 offered by the Gas Company. The Gas Company undertook that the maximum charge for gas per annum should be £20. Then the question of the life of the installation had to be considered. The Corporation had had experience of arc lamps There were some outside the Town Hall which were not being used because they were worn out—their life being three years. They might take it that, in addition to £6 per annum for five years, at the end of that time they would have to replace pretty well the whole of the lamps. The report was very misleading in stating that the cost of lighting the market by gas last year was £73. The reason the charge was so high was because the fittings were old, out of date, and most wasteful. With new fittings and the present system of lighting, the cost would have been much lower; and with incandescent lighting, the annual charge tendered for was £20. The Committee seemed to have made up their minds that the electric light was a very nice thing. But they ought to cut their coat according to their cloth; and when they were talking so much on every side about the necessity for economy in the town, they ought not to adopt the extravagant proposal before them. Mr. Griffin remarked that the recommendation was not a unanimous one. Personally, he did not think the electric light was worth 50 per cent. more than gas; and this was what it came to. The Mayor (Mr. Tomkinson) thought it would be better to defer the question. Mr. Adam said there was no desire to press the subject unduly. If the Electric Lighting Company did not enter into a guarantee, the matter would have to be reconsidered. Electric light would cost £30 a year more than gas in the market; but the Committee thought it worth it for the better light. It was decided that the paragraph containing the recommendation should be eliminated from the report, and that the Committee should reconsider the matter, and invite the Council to inspect both the electric and gas lighting in the market.

In response to an application for tenders for supplying and laying about 3760 lineal yards of 6-inch cast-iron pipes, with valves, &c., complete, the Wigton Urban District Council received 17. The tenders for vertical cast pipes ranged from £2543 down to £1515; those for angle cast pipes, from £1844 down to £1471. The tender of Messrs. Aird and Sons for £1515 for vertical cast pipes was accepted, conditionally upon the Local Government Board sanctioning the scheme, which is estimated to cost £2000.

THE LIGHTING OF OXFORD STREET.

At the Fortnightly Meeting of the Marylebone Borough Council on the 5th inst., the following report of the Lighting Committee was brought up in a supplementary *agenda*.

We report that we have again considered the question of the lighting of Oxford Street, and have received a fresh scheme from Mr. Arthur Wright, the Council's Consulting Electrical Engineer, on behalf of the Electric Supply Committee, for the lighting of the street with electricity, as follows.

July 3, 1906.

To the Chairman and Members of the Lighting Committee.

LIGHTING OF OXFORD STREET.

I have again considered, in accordance with your instructions, the above question, and append herewith my estimate of the cost of lighting Oxford Street, between Marble Arch and Tottenham Court Road, by means of 80 flame arc lamps. I propose that 70 of these lamps should be suspended from 35 arc lamp-posts, two on each post, placed on refuges down the centre of the street; six posts with single lamps, also on refuges down the centre of the street; and five posts each supporting a single lamp erected on the pavement at the Tottenham Court Road end, where the street is too narrow and the traffic too heavy to admit of their being placed in the centre. My estimate of capital expenditure is based on quotations previously received for the single-arm posts; the prices being modified on account of the posts being adapted to carry two lamps. As before, I have assumed that 45 lamps would be burned from dusk to dawn, and the remaining 36 from dusk to half-an-hour after midnight. The makers of the lamps will guarantee a minimum of 1500-candle power from each; but the mean candle power will be considerably higher. With regard to the height of the lamp-posts, I am of opinion that this should not be less than 22 feet, and preferably 25 feet, from the road level to the centre of the lamp.

Should your Committee decide on accepting the design herewith submitted and recommended, I shall be in a position to recommend the Electricity Committee to undertake the installation and maintenance of the lamps for an inclusive sum of £1850 per annum.

ARTHUR WRIGHT.

We also have to report that we addressed a letter to the Gaslight and Coke Company informing them that the Council had referred the subject of the lighting of Oxford Street back to the Committee for further consideration, and asking whether they wish to amend the scheme submitted by them; and we received a reply stating that they did not desire to do so.

We are of opinion that it is undesirable for the Council to raise a loan for the small sum of £2500 necessary to be expended for the electric light installation, as has been suggested, and consider that this amount should be defrayed out of the current rate, which would reduce the annual charge of £1850 proposed to be made under Mr. Wright's new scheme to £1675; and, after full consideration of the scheme submitted on behalf of the Electric Supply Committee, as above set forth, we recommend that the offer of the Electric Supply Committee to light Oxford Street with electricity in accordance with the above-mentioned scheme, at an estimated cost of £2500 for the installation, and for the subsequent maintenance of the lamps and columns and supply of electricity for the sum of £1675 per annum, be accepted.

Mr. FOWLER, in moving the adoption of the report and recommendation, said that further consideration had led the Committee to the conclusion that it would be advisable to use electricity instead of gas, as the former illuminant would cost less than the latter, and the light from the arc lamps would be greater than was at first anticipated. The arc lamps being placed in the centre of the road would give better light than lamps on the pavement, as at first proposed.

Mr. LEWIS, in opposing, remarked that gas would be far preferable, as considerable improvements had of late been made in this method of lighting. The adoption of arc lamps would result in very much greater expense to the ratepayers; while the light from electricity would not be so much as from gas. He urged that the heavy account which the borough already paid for its electric light should not be added to.

Mr. WATSON asked what provision would be made in case the electric light failed, as it so often did in other places.

Mr. WHITE said that the scheme recommended would have the result that while in some places in Oxford Street there would be enough light to blind people, in others there would be comparative darkness. He congratulated the Committee on the wisdom of the proposal not to ask the London County Council for more money, as that authority had refused to deal with any new scheme of arc lighting if they had to lend money for the purpose.

Dr. LEAF, in answer to observations made by the last speaker, said that Mr. Wright did not advocate electricity for Oxford Street. As a matter of fact, he would not have brought up the present report except on pressure by the Committee.

A MEMBER: That is a most excellent argument in favour of gas.

Mr. HURST expressed surprise that the Committee should alter their opinion on the relative merits of gas and electricity in so short a time. They had gone back on the tenders; and they would do no good in this to the borough in the long run. He hoped that on some foggy night they would not have Oxford Street plunged into total darkness owing to the failure of electric light.

Mr. FUELLING denied that the Committee had now gone back on the tenders.

Mr. LEA-SMITH said he felt bound to say frankly that, in his opinion, the Council would make a great mistake if they adopted electricity in preference to gas for street lighting.

Alderman M. MORRIS corroborated Dr. Leaf's statement that it was only under pressure of the Committee that Mr. Wright brought forward the present scheme.

Rev. RUSSELL WAKEFIELD remarked that personally he was in favour of gas, and expressed the hope that if the Council decided upon electricity they would not go in for carrying out the installation in the cheapest possible way.

Colonel HOPKINS said much talk had taken place about Mr. Wright being against the gas scheme. This was not so, as he had not taken an active part one way or the other in the matter.

In the result, the motion for the adoption of the Committee's report and the recommendation was carried.

GAS-WORKS EXTENSIONS AT LEEK.

Some weeks ago, the Leek Gas Committee considered a report which had been submitted to them by Mr. J. Ferguson Bell (at the request of the Manager, Mr. A. A. T. Botteley) with regard to tenders received for extensions at the gas-works. Six firms tendered for the erection of a bench of inclined retorts, consisting of three beds of eight retorts in each, ⌂ section, 24 inches by 15 inches at bottom, tapered to 20 inches by 15 inches at top, and 20 feet long; and each firm submitted drawings of the settings they proposed to erect, with the necessary ironwork and coal-handling plant to the Council's specification. Mr. Bell pointed out that the tenders were not strictly comparable as regarded price, because each firm tendered for its own special form of setting, some of which were shown to be more lightly built than others. The setting which commended itself to him was that of Messrs. W. J. Jenkins and Co., Limited, of Retford; and he recommended the acceptance of their tender for £3480. The Committee therefore recommended the Urban District Council to accept Messrs. Jenkins's tender. When, however, the matter came before the Council, there was a considerable amount of opposition to the proposal; and eventually an amendment —proposed by Mr. Ingham—was carried by one vote that a deputation should visit Todmorden and inspect the inclined retorts erected there by Messrs. Drakes Limited (whose tender of £3300 was the lowest one sent in). Subsequently, a member suggested that it would be unfair to Mr. Bell and Messrs. Jenkins if the deputation visited only one place; and thereupon a further amendment was carried, by one vote, that the deputation should also visit the Derby Gas-Works.

The deputation consisted of Mr. Ingham, Mr. Morton (who had also voted for it), Mr. Booth (who had voted against it), and the Manager; and at the next meeting of the Council they presented their report. All the gentlemen named visited Derby; but Mr. Morton was unable to accompany the party to Todmorden and Shipley. The report was to the effect that they had carefully and thoroughly examined the retorts and settings of the different contractors as far as possible, also the ironwork and conveyors; and they were unanimously of the opinion that the Council would be acting wisely in accepting the Gas Committee's recommendation. Another long discussion ensued upon this; and an amendment was moved that Messrs. Drakes' tender be accepted; but this only had the support of the mover and seconder. A similar fate met a proposition that the Council should do the work themselves; Mr. Ingham remarking that it would be most unfair to take the plans prepared by other people to work from. The original recommendation of the Committee was then carried, with only two dissentients.

Reductions in Price.—The Walsall Town Council have approved a recommendation by the Gas Committee that the price of gas to manufacturers be reduced from 2s. 3d. to 2s. per 1000 cubic feet.——At Bolton, from the 1st of October next, the price of gas will be reduced 2d. per 1000 cubic feet, making the net price 2s. 4d.——The Oswaldtwistle District Council have reduced the price of gas from 2s. 11d. to 2s. 8½d. per 1000 cubic feet, with a discount of 2½d. per 1000 to consumers of less than 23,000 cubic feet, and of 3½d. per 1000 to those using more than this quantity.

Improved Public Lighting at Northwich.—A new contract has been entered into between the Northwich District Council and the Gas Company for lighting the public thoroughfares. Under it, 263 lamps of the old type are to be replaced by special ones fitted with incandescent burners. The alteration will cost the Company £350; but the lamps will be the property of the Council, and an additional £30 or £40 will be the only extra cost the ratepayers will have to bear for a greatly improved light. The contract is for the next five years; and in settling its terms the Gas Company are considered to have met the Council and the town in the most liberal fashion.

Income-Tax on Water-Works at Llangollen.—At the last monthly meeting of the Llangollen Urban District Council, Mr. E. F. Jones, the Clerk and Solicitor, stated that the Income-Tax Commissioners had decided that in future the water undertaking of the Council should be assessed for income-tax. He protested against this. The water-works were owned by the Council, who were agents of the ratepayers, and therefore they made no profit. He reminded them, however, that they were only a small authority, and though he had no doubt that, on appeal, the decision of the Commissioners would be reversed, their financial position scarcely justified them in going farther in the matter. It was decided to pay the amount of tax demanded, and to authorize the Clerk to bring the matter under the notice of the Association of District Councils.

Shifnal Public Lighting.—At the meeting of the Shifnal Parish Council last Tuesday, the Lighting and Churchyard Committee reported that the Shifnal Gas Company had tendered for the ensuing season's public lighting at the rate of 4s. per 1000 cubic feet; or alternative terms of £2 2s. per ordinary burner, and £1 17s. per incandescent burner for the season. The Committee recommended that the alternative terms be accepted. The Chairman (Mr. J. Leake, jun.) explained that the effect of the tender was that the cost of gas per incandescent burner would be 5s. less than it had hitherto been. Mr. Lawrence said it would be a great saving, and an immense improvement to the town, if incandescent burners were substituted for the ordinary ones throughout. He believed it was the intention of the Committee to consider the question. The Chairman said they were considering the advisability of extending the use of these burners, and would shortly bring forward a recommendation on the subject. The report was adopted.

INSPECTION OF FACTORIES AND WORKSHOPS.

Report of the Chief Inspector for the Past Year.

The report of the Chief Inspector of Factories and Workshops (Dr. Arthur Whitelegge, C.B.) for the past year was issued last week. It includes, as usual, the reports of the Superintending Inspectors for the several districts, which contain some references to matters in which our readers are interested.

The Chief Inspector states that at the end of the year there were upon the registers 107,193 factories and 144,619 workshops, including laundries, but not men's workshops, docks, warehouses, or (in general) domestic workshops. Though the registration of men's workshops is still incomplete, there were 21,883 entries of these—a net increase of 2387 in 1905. The number of works under special rules and regulations was raised by 6531, owing mainly to the new codes for docks and self-acting mules. The number of persons employed in factories is (approximately) 4,150,000; in workshops (excluding men's workshops), 700,000; and in laundries, 100,000. There were 100,609 accidents reported last year; being an increase of 8·2 per cent., compared with 0·4 per cent. in 1904 and 2·5 per cent. in 1903. In fatal accidents there was a rise of 4·4 per cent. following a decline of 2·8 per cent. in 1904. There were 26 fatal and 212 non-fatal accidents in gas-works reported to certifying surgeons as well as to inspectors. The former was an increase of 10, or 62·5 per cent., and the latter a decrease of 4, or 1·8 per cent., compared with the year 1904. Dr. Whitelegge points out that the Esk Valley Power Gas Order Confirmation Act, 1905, like other recent Acts authorizing the manufacture and distribution of power gas, requires that the proportion of carbonic oxide shall not exceed 14 per cent., and that the gas shall be odorized. The Act also imposes on the Inspectors of Factories the duty of enforcing these provisions in factories and workshops.

Turning to the reports of the Superintending Inspectors, Mr. W. A. Beaumont, who supervises the southern division, states that the most noted industrial development during the past year was the continued increase in the use of electrically driven machinery and plants for producing power gas. Several of the local Inspectors bear testimony to this. Mr. Harston (Kent) says electrical power has taken the place of gas and steam in a good many factories; but perhaps the most striking feature of the year's changes is the great increase in the number of factories in which plant has been, or is being, erected for the manufacture of producer gas for motive power purposes. Mr. Edwards (Southampton) remarks that one of the principal industrial developments last year was the laying down of a large number of gas-producing plants in factories, thereby doing away with steam power; while Mr. Seymour (also of Southampton) says the use of plants for producing suction gas is very greatly on the increase. One meets with them constantly, not only in the towns but in isolated places such as country flour mills. Mr. Ireland (Norwich) on the same subject says: "I find in this district the same development I noted in the Midlands—the fitting of gas-engines with water-gas generating plant operated by the engine itself. In these no gasholder is necessary, as the gas is made only when the engine is running, and is used as it is generated. In addition, no separate steam generator is necessary, as is the case in the old type of producer. There is thus a considerable cheapening in the cost of the plant, and it is being laid down in increasing numbers." Mr. Bremner-Davis (North London) says suction-gas plants for large and small gas-engines have proved successful both mechanically and economically. "As the gas in this case is produced only at the moment of suction by the piston of the engine, to which the plant is quite close, there is no actual storage of gas anywhere, and the danger of leakage is reduced. The gas-engine for large powers is now an established success. But I find that there are many of the experienced who, though well aware of its advantages in some ways, still prefer to use steam." Mr. Thomas (also writing of North London) says many small occupiers have gone in for power, thus converting their workshops into factories. The source of power chosen is usually an electric motor; but in larger factories he has noted an increase in the number of power-gas plants. As a rule, they are placed outside the factory, under a shed, and then no gas or fumes can escape into the work-rooms. Mr. Wilson (East London) has noticed a distinct tendency to replace steam by gas, and still more by electricity. Mr. Beverley (West London) mentions the erection in that district of three important generating stations, including one which will be the largest in the kingdom. One of them has two gas-engines of 1000-horse power.

Mr. Vesey-Smith (Norwich) draws attention to the dangers of using acetylene gas. He points out that generators should never be placed in any room which cannot be devoted entirely to their use; and that the generator should not be in the same room as the jet itself. He says it is advisable to place the generator in an outhouse, or in a room entirely given up to it. The question of the freezing of the water in cold weather, causing a failure of the gas, and also accidents (as have actually happened) seems to cause a difficulty. Frost may attack either the water in the generator or in the pipes which supply the water. To dissolve substances in the water, and thus to lower its freezing-point, seems, he says, a highly efficacious method of obviating this difficulty. A 14 per cent. solution of calcium chloride does not freeze until 14½° Fahr. Commercial glycerine is also a substance which might be added. Mr. Vesey-Smith holds that young and inexperienced persons should not be allowed to meddle with or repair generators except under strict supervision, as there is always a temptation to smoke.

Mr. Beaumont says the enforcement of the new code for tar distilleries, to which reference has already been made in the "JOURNAL," appears to have been receiving the desired attention from the staff. Mr. Wilson (East London) reports on this subject as follows:—

> The voluntary regulations are well observed in the larger works; but some of the smaller ones still continue to a great extent on the principle that because an accident has never occurred probably none ever will. In two very large tar-works, every possible precaution against accident is taken, and all the necessary safety and emergency appliances are kept in readiness. The safety belt and ropes do not seem to be much used by the men when first entering a still. Some of the foremen, with long experience, have expressed the opinion that they actually increase the danger, as, in the event of a man losing consciousness in a still, the ropes would very probably become entangled in the steam-pipe stays inside, and so make the task of getting him out still more difficult. In the smaller works, the stills are usually quite separate from one another; each being connected to its own receiver. The distillation products are received in barrels, which are removed when full, and the waste-gas pipes are provided with a water-seal to prevent back-pressure. After the pitch is run out, preparatory to cleaning the still, the passage of steam through it is continued for some time, both for purposes of ventilation and to assist in cleaning. In these circumstances, and with ordinary care, there should be no risk of accident, since there seems to be no possibility of harmful gases finding their way in. In the larger works, where the stills are interconnected, blank flanges are generally inserted between all the disconnections, and the still is ventilated by steam. In this case, the still being entirely isolated, there is no possibility of accident. In other works, the top flange of a **T**-piece on the still-head is removed, and, after closing a stopcock on the condenser-pipe, the still is ventilated by blowing steam through. Almost all the stills are now provided with efficient safety-valves. A cylinder of compressed oxygen is usually kept on the premises.

On the subject of tar distilling, Mr. Ireland (Norwich) gives the following particulars:—

> In one of the works in this district, where there is a mechanical mixer in the still, it is impracticable to provide the belts and ropes for the men employed in cleaning out the still. In this case, however, steam is blown through the still after the disconnections are made; and this should be effectual in clearing it of any gas likely to affect the men. In this factory, the discharge-cock is not disconnected. It is a plug-cock fitted with a detachable handle; and since the handle is removed, and the two men employed inside the still are the only persons likely to open the cock, it is considered by the occupier and Manager of this factory that disconnection is unnecessary. In the other factories in this district, it appears to be considered that by simply leaving the still disconnected for a day or two—say, from Saturday to Monday—it will be thoroughly cleared of gas, and that there will consequently be no necessity in their case for safeguards. This is a dangerous, if comfortable, conclusion. There may be a slight through draught in the still after the disconnections are made—if these include the removal of the discharge pipe or cock. But under the most favourable circumstances this will be insufficient to clear every part of the still of gas; and under unfavourable atmospheric conditions the only displacement of gas would be by the diffusion of air into the still. To dispel the gas, there must be a mechanichl displacement, such as there is in the first case referred to, where there is a mechanical circulation of steam through every part of the still.

Referring to the increasing use of suction gas as a motive power, Mr. Beaumont lays stress upon the point that, wherever possible, the plant for producing it should be so placed that any escaping gas would not be harmful to the workers. Mr. Seymour (Southampton) gives particulars in regard to premises in his district where producer gas is the motive power, and says that, though no accidents from poisoning have been reported, in several instances, where the plant is completely enclosed in a shed or similar building, the man in charge has admitted suffering from an occasional dizziness. In all places he has urged very thorough ventilation. Mr. Wright (Northampton) gives the following particulars about producer gas:—

> Power gas is coming much into use in this district, and supplanting the ordinary town gas supply for engines over 12-horse power. It is, in the majority of installations, on the suction principle. On visiting works, I find, as a rule, that the plant is placed in suitable positions, and arrangements are made for sufficient ventilation; but in several instances the engine-room has been very faulty in this respect. Where I have found such conditions existing, I have taken particular care to interview the occupier personally, and explain where the improvement should be made. In every case where power gas is in use, a copy of the memorandum has been sent with the covering letter asking that it may be read over to persons likely to be in charge of the plant. No accidents have been reported from the use of producer gas during the year.

Mr. Thomas says plant for the production of power gas is sometimes found in the factory; and in one instance he came across a suction plant in a basement where women were employed. He points out that so long as the engine is at work and drawing off the gas generated by the producer, little risk of injury to health exists; but when the engine stops, there is bound to be an accumulation of gas in the mains leading from the generator to the engine, which might leak into the workroom through a faulty joint. Having this in view, he says it certainly seems undesirable to have these plants inside the factory, unless isolated and separately ventilated. Mr. Stevenson-Taylor (Kent) reports on the subject of producer gas, that, though there has been a large increase in the amount of this gas used for power purposes, and carburetted water-gas plant has been installed in one large gas-works, no serious cases of carbon monoxide poisoning came to his notice.

Mr. J. A. Redgrave, the Superintending Inspector for the Midland Division, has produced an interesting report. In the section on "Industrial Developments," Mr. Garvie (Wolverhampton) bears testimony to the great increase that has taken place in the use of generators of power gas in his district. He says the 1000 brake-horse-power installation mentioned by him last year has displaced 20 steam-boilers. The firm have now upwards of 2000-horse power in gas-engines, and are adding a 300 brake-horse-power oil-engine—all for generating electricity for light and power. Referring to Mond gas, Mr. Garvie says the use of it has been discontinued by several of the people who had taken it up; but, on the other hand, others were about to introduce it. He says power gas is greatly affecting the use of electricity from electrical power stations, so much so that some of these are quoting less than ¾d. per unit to large consumers. Of course, the price to small consumers, especially to those who use the current between six and eight o'clock, is very different. Mr. Garvie had the following comparative figures given to him by the occupier of a factory using 80-horse power, who formerly had a steam-engine and boiler, but has displaced them for gas-engines:

Steam, actual cost	106s. per week.
Town gas, actual cost	56s. ,, ,,
Mond gas, ,, ,, ...	36s. ,, ,,
Suction gas, estimated	26s. ,, ,,
Electricity, quoted by corporation engineer. .	168s. ,, ,,

A large factory for the manufacture of tar macadam has been erected

in the Wolverhampton district. The slag is tipped alongside narrow-gauge rails, where little waggons are filled and run down by gravity to the foot of the incline. Then an endless chain carries them up to the top of the works, where men pass them into a cradle, which is rotated, and empties the pieces of slag into a large hopper, which feeds the breakers, whence the broken slag passes into revolving cylinders. These deliver the various sizes of stone into respective compartments; from them it enters the tar-mixers; and the finished product is delivered direct into railway waggons below. The tar comes from the gas-works in canal boats, whence it is pumped to heaters, and then, still hot, up to the mixers.

Mr. May (Worcester) calls attention to the importance of proper lighting in preventing accidents; and the Superintending Inspector is quite in accord with his views as to the risks encountered through faulty lighting and the tardy methods so often adopted. Mr. May says:

I have given some time to this question during the past year, with a view to seeing whether the accidents caused by falls, &c., are possibly caused by faulty lighting. Reference to the accident record showed that accidents were considerably more numerous in the winter than in the summer months; and I extracted those which occurred during the hours of darkness or semi-darkness at the end of 1904 and the beginning of 1905, and have since inquired into a considerable number of them. I am bound to confess that my suspicions have not been confirmed. But at the same time, I still hold the view that accidents may be caused indirectly by bad lighting; and inquiry into the point in districts where accidents are more numerous than they are in the Worcester district would, I venture to think, prove that this is a fact. Inspection of works during the time of lighting up has brought to my notice several instances of very bad lighting in open yards, on staircases, and near machinery.

As a rule, the tar-distilling works in the Midland Division were carried on satisfactorily last year. Mr. Sydney Smith (Derby), however, conducted a special inquiry on this subject, and reported as follows:—

During the year, I was engaged on 12 days visiting 23 tar-distilleries, in which objections had been raised to the voluntary regulations for the safety of workpeople employed in the various operations carried on in these factories. The works visited are situated in the Manchester, Preston, South Wales, Newcastle, Leeds, Bradford, Huddersfield, and North Staffordshire districts. As the result of my visits, all objections to the regulations have been withdrawn. I have recently visited the three tar-distilleries in this [Derby] district; but in none were the safety regulations strictly carried out. At one works which I visited in 1904, when engaged on the special inquiry as to the dangers in this class of works, I found the tar-stills had not been fitted with safety-valves. I am pleased to report that I have just received a written assurance from the occupier that valves will be fitted without further delay. At the second works facilities had not been provided for disconnecting the waste-gas pipes when cleansing out the stills, and reliance was placed on the cocks. I have since heard that the waste-gas pipe connections have been altered, and flanged joints inserted, so that blank flanges can be readily introduced, in accordance with Regulation 2, when the stills are being cleaned. At the third works, there were no chemical respirators. The manager had a supply of the "Evertrusty" respirator, which is quite suitable for the prevention of inhalation of dust, but useless in the presence of poisonous gases, such as sulphuretted hydrogen. An undertaking was given to procure suitable and efficient chemical respirators.

In the North-Eastern Division, of which Mr. J. S. Maitland is the Superintending Inspector, the nine tar-distilleries satisfactorily complied with all the requirements last year. Carbon monoxide was responsible for five deaths; one being caused by Dowson gas. A man employed as a fitter in an agricultultural implement works was assisting in repairing a defective gasholder, which had been exhausted as far as possible. A circular piece, about 9 inches in diameter, had been taken off to effect the repair, and work finished at noon; the timekeeper and the deceased being the only persons left on the premises. In the evening, the former discovered the deceased lying with his face almost directly over the hole already mentioned, and when taken to the hospital he was found to be dead. The District Inspector (Mr. Bennett) thinks that if the rule as to flushing a gas-vessel with air before entering it means that the holder should have had air blown through it before being repaired, this provision was not observed. The hole referred to had, however, been left open for a couple of hours before the deceased began to work at the patch.

An appendix to Mr. Maitland's report contains a description, written by Mr. Bennett, of the Simon-Carvès plant for the production of coke and the recovery of bye-products (which came under the supervision of the Factory Inspectors last year), and an indication of the dangers attending its working. As these plants are growing in number and importance, it may be of interest to give the following extracts from Mr. Bennett's observations:—

The plant may be divided into five sections: (1) The exhausted-gas mains, including the bye-pass valves, tar and ammoniacal liquor tanks, and condensers. (2) The forced-gas mains, including the ammoniacal and benzol scrubbers, purifiers, and residual-gas mains. (3) The sulphate of ammonia plant. (4) The benzol plant. (5) The crude naphthalene plant, &c.

1.—There is practically no danger from the gases in this section, as the mains are in the open air, and the tendency due to the exhausters is to suck air in rather than to allow gas to escape from the mains. The tar and ammoniacal liquor tanks are usually in pits below the ground level, and there is danger of falling into them, unless they are properly railed off. More especially is this so at night time—the process being continuous; so that efficient lighting is necessary there.

2.—Danger from explosion may arise if and when, at any opening, nozzle, valve, or leak, the gases have mixed with air, and come in contact with a naked light. This is avoided by having the premises lighted by electricity. An explosion occurred at one colliery plant whilst a boiler-tenter was lighting the residual gas-jets in a boiler-furnace, owing to his having turned on the gas and air before having the lighting-taper ready. Purifier-houses should be quite open at both sides, and louvres placed in the ridge of the roof, in order to avoid gassing from sulphuretted hydrogen. Also the floor level should not exceed 2 feet below that of ground.

3.—In the sulphate of ammonia plant, the sulphuric acid is blown up into the acid reservoir by compressed air, and the sulphate is blown from the bottom of the saturator-vat by steam-jet, so that there is but little danger in these respects. Naked lights should be prohibited in these buildings, as a leak might occur in the saturator. All the vats met with were over 3 feet high and open all round.

4.—The chief danger in this plant—and, indeed, in the whole manufacture—is that of temporary gassing or asphyxiation during the supervision of the benzol separator. In the type of plant first used, the benzol is separated from condensed water, &c., by gravity. The level of the water is kept constant by syphonic action; but it is necessary to see that the water does not get too low. This can be readily done by means of a pipette, without unnecessary exposure to the gas. It is usual to get 65 per cent. dryness in benzol.

Notices should be affixed at the entrances to the benzol-houses, prohibiting naked lights therein. The separator-lid should be well sealed. Oxygen tubes with respiratory apparatus should be kept in both the benzol and the sulphate houses.

Reporting upon the North-Western Division, Mr. H. S. Richmond says there were 101 cases of industrial poisoning last year, compared with 1904. Several of them were due to carbon monoxide; and Mr. Rogers (Blackburn) mentions some which occurred in the autumn in a Blackburn weaving-shed through an escape of illuminating gas due to a defect in the pipes. Shortly before this accident, an escape occurred in a Preston shed; but he believes no illness was produced, as the escape was detected in time, and the weavers prevented from entering the shed until the gas had been expelled. The latter case was attributable to the main gas-cock being over-turned when the lights were last previously extinguished, thus slightly re-opening the supply-pipe, and the taps at the jets were not closed. Mr. Rogers points out that many of the gas-cocks are not provided with stop-pins or other appliances which would indicate, beyond the possibility of a mistake, when the gas was cut off. In these cases, the spindle has usually to be turned over until a groove in it is vertical or horizontal, as the case may be. He drew the attention of the two gas engineers to this matter, and to the desirability of securing periodical examination of fittings, especially before the winter lighting-up time. As their own responsibility ceased at the meter, and the fittings belonged to the owner or occupier of the factory, the supplying authorities could not effect these admittedly desirable changes themselves. They recognized, however, that something could be done in the direction of warning manufacturers; and Mr. H. Green, the Engineer of the Preston Gas Company, agreed to send a circular on the subject to all their large consumers.

In the report of Mr. S. H. Knyvett on the Scotland and Ireland Division, there are some excellent remarks by Mr. Lauder (West Scotland) concerning the safeguarding of machinery, and particularly in regard to the treatment of shafting. He says gas-engines continue to give some trouble with regard to fencing. Occupiers will persist in erecting a wooden engine-house round the engine, and never seem to think anything more is necessary for safety. When informed that fencing is still required inside the house, Mr. Lauder says they seem much astonished, and "proudly proclaim the fact that the door of the engine-house is kept shut, and no one is allowed to enter but the engine-man." Over and over again he has found this to be the case; and in many instances the fencing afterwards erected is very unsatisfactory, and nothing more can be done till the house has been taken down altogether, and re-arranged to suit the fencing. He invariably recommends occupiers to fence the engine in such a manner that no one can stand inside the fence when the engine is in motion, and then to erect the engine-house, allowing sufficient space for the attendant to pass round the engine outside the fencing. Mr. Lauder has given some attention to effecting improvements in the style of fencing erected at the fly-wheels of engines and machines. He says it is a common practice to find such fences merely consisting of one or two horizontal rails close to the wheel, and perhaps 3 ft. 6 in. high. This he does not consider safe; and he has been strongly pressing occupiers to raise the fence somewhat, and cover the space immediately in front of the fly-wheel with wire netting or sheet iron.

The last report calling for notice is that of the Electrical Inspector of Factories (Mr. G. Scott Ram), in the course of which he states that the following accidents were notified last year at the stations of companies or local authorities supplying electricity: Non-electrical, 167 non-fatal and 7 fatal; electrical, 32 non-fatal and 3 fatal. There were 53 accidents in private electricity generating stations; but there were no fatalities. In factories, engineering works, &c., there were 118 non-fatal and 4 fatal accidents. Of the former, 22 were due to faulty apparatus, and 17 happened to skilled persons working on "live" conductors. Mr. Ram says most of the former occurred with portable appliances; nine being due to burns or shocks received from lamps. The accidents to skilled persons happened mostly at switchboards; and they serve to emphasize the folly of working on "live" conductors. As the Inspector remarks, probably in nearly all the cases the work could have been carried out in safety after factory hours. There were a few accidents to unskilled persons, who were presumably working under the direction of others who failed to give proper supervision.

Gas for Lighting Asylums.

At the Meeting of the London County Council last Tuesday, the Asylums Committee presented a report in which they stated that, in connection with the approaching opening of Long Grove Asylum, they had for some time been in negotiation with the Epsom and Ewell Gas Company for a revision of the terms upon which they supply gas to the three asylums already on the Horton Estate. The Committee have now obtained from the Company an offer, which they have accepted, to supply gas to all the asylums on the estate (including Long Grove Asylum) at a flat-rate of 2s. 9d. per 1000 cubic feet for a minimum yearly consumption of 9 million cubic feet; this rate to be subject, in the event of a reduction to ordinary consumers (now charged 3s. 7d. per 1000 cubic feet) to an allowance of ⅜d. for every 1d. so reduced—any advance in price to be in the same proportion. The necessary agreement will be made for a term of five years. The report was received.

Athens Water Supply.—The American Consul at Athens states that plans for furnishing an adequate water supply to the city by bringing down the waters of Lake Stymphalos, a distance of more than 62 miles, are nearly complete. The aqueduct will consist of masonry, where necessary, and of iron pipes. A Company, it is added, will be formed, with a capital of nearly £1,250,000. There will be an additional loan by the Company of £705,000 guaranteed by the Greek Government.

THE EXPLOSION AT THE COVENTRY GAS-WORKS.

Mr. Stevenson's Explanation.

In the last number of the "JOURNAL," we briefly reported the occurrence of a serious explosion at the gas-works of the Coventry Corporation; and, unfortunately, one of the injured men (Howarth) died on Saturday.

According to a statement made to a representative of a local newspaper by Mr. Fletcher W. Stevenson, the Gas Engineer and Manager, it took place about half-past ten on the night of Sunday, the 8th inst., in the purifying-house, with the result that three men—Mr. Joseph Winstanley (Works Manager), Mr. Edward Howarth and Mr. George Taylor (foremen stokers) were burnt, and had to be removed to the hospital. Fortunately, however, only the last named sustained serious injuries. The City Fire Brigade were summoned, and the Dunlop Fire Brigade rendered assistance. By their combined energetic action, the fire following the explosion was extinguished before a very great deal of damage was done; and work was resumed by four o'clock next morning. The Gas Committee had a special meeting early on Tuesday, when Mr. Stevenson reported the accident, of which he was authorized to issue the following official account: "The explosion occurred in the purifying-house, in which are six purifiers raised upon a girder floor above the ground level. The purifiers have periodically to be emptied and refilled, and when being emptied the material is discharged through openings in the bottom, which normally are closed with iron doors made gas-tight. One of these purifiers was refilled on Saturday morning previous to the explosion, and the gas-valves connecting it turned on; but, unfortunately, the bottom discharge door was not shut. Owing to the annual excursion of the employees of the department on Saturday last, gas making was stopped from 6 a.m. on that day to 8 p.m. on Sunday, to enable as many as possible to go; and when gas-making was commenced again at 8 p.m. on Sunday, the whole of the gas made escaped through the open door in the bottom of the purifier. The foreman on duty appears to have reported to Mr. Winstanley, the Works Manager, that the gas was not going into the gasholders; but at present it is not known how long Mr. Winstanley knew anything about the matter. Mr. Winstanley, evidently trying to find where the gas was getting away, went into the purifying-house with the two foremen, Howarth and Taylor, one of whom carried a safety-lamp at which the gas ignited, causing the explosion and consequent fire. The safety-lamp was evidently faulty. The Gas Committee deeply deplore the serious accident and the injuries sustained by Mr. Winstanley and the two foremen, and have approved of the steps I am taking to ensure proper and efficient safety-lamps being used."

LIVERPOOL CORPORATION WATER SUPPLY.

Engineer's Annual Report.

We have received from the Water Engineer of the Liverpool Corporation (Mr. Joseph Parry, M.Inst.C.E.) his seventh annual report, covering the twelve months ending Dec. 31 last. It extends to about 70 pages, and is accompanied by a number of maps, diagrams, and reproductions of photographs.

Mr. Parry opens his report by saying that the year 1905 will always occupy a prominent place in the history of the Liverpool water supply, as the period in which works were completed for bringing to the city a second instalment of water from Lake Vyrnwy. The Vyrnwy scheme was designed to provide for Liverpool a total supply of 40 million gallons per day. In carrying out the works the lake was made large enough to give off the full quantity in the driest year, and the tunnels were also constructed for the full delivery; but the iron pipes, which form nearly the whole of the aqueduct, were arranged so that three lines of equal capacity would be required to carry forward the total quantity the watershed was estimated to yield. Only one of these lines was laid in the first instance; but easements were acquired through a strip of land 33 feet in width right across the country from Vyrnwy to Prescot, in which the Corporation could place the pipes as required. The laying of the first of the three lines was commenced in 1881, and completed in July, 1892. The laying of the second line was then started, and was completed and formally opened on Oct. 16, 1905. The whole of the Vyrnwy supply is filtered through sand filter-beds at Owestry, at a distance of nearly 19 miles from the lake. The pipes in the first line from Vyrnwy to Prescot were designed to discharge from 15 to 17 million gallons per day; and by the second line, between Owestry and Prescot, the measured rate of discharge varies from 18¾ to 19¼ million gallons per day. For the second instalment of Vyrnwy water, a balancing reservoir at Parc Uchaf, a reservoir at Malpas (Cheshire), and additional filter-beds at Owestry, increasing the filtering capacity by 6 million gallons per day, have yet to be completed.

The average quantity of water available for Liverpool and Chorley from the Rivington watershed during a period of dry years, after delivery of compensation water to the rivers, is nearly 11½ million gallons per day. During wet years, the yield is, of course, much higher; but the result of drawing off more than the average dry-weather yield was seen last year, when the Rivington reservoirs were nearly empty, and it became necessary to curtail the supply. From the first and second Vyrnwy instalments, about 33 million gallons per day are immediately available; and from the wells about 4 million gallons per day can be pumped—making the total quantity of water now available for distribution 48 million gallons per day. The average consumption in the Liverpool district last year was 27 million gallons per day; but as the deficiency of water made it necessary to abandon temporarily the constant service during a portion of the summer, the consumption cannot be taken as a fair measure of future requirements. For the population at present supplied from the Liverpool works, and taking into account the water supply to Chorley and in bulk to local authorities under agreements which have been entered into by the Corporation, the maximum summer demands at the present time may be assumed to be about 36 million, and the maximum winter demands about 37 million, gallons per day. The supplies in bulk to local authorities amounted to an average of 2,147,000 gallons per day, and may increase under existing agreements to about 4,500,000 gallons per day. These figures show that the Committee have in reserve a quantity of water amounting to at least between 12 and 13 million gallons per day available for meeting the domestic and trade requirements of the future, and for possible demands under the Wallasey and other agreements. How many years will elapse before this reserve is exhausted, and before a third instalment of Vyrnwy water is required, will depend, Mr. Parry says, upon the care exercised in guarding the resources, and upon the efficiency of the measures adopted for the prevention of waste and misuse. He emphasizes the importance of plumbing work being regularly inspected, and no extravagant waste of water permitted. Except under very clearly defined and limited circumstances, no use of water should, he thinks, be sanctioned which is not intended to be of a permanent character.

Mr. Parry next proceeds to give a detailed account, with illustrations, of the works carried out in connection with the second instalment of Vyrnwy water, and describes how the Manchester Ship Canal and other canals, as well as the River Mersey, were crossed in the construction of the section leading from Norton to Prescot. The crossing of the Mersey was the most important section of the work in this division. The entrance to the tunnel from the Cheshire side is through a vertical shaft 51 feet deep and 9 feet in diameter, and the exit on the Lancashire side is through a vertical shaft 46 ft. 6 in. deep and 9 ft. 9 in. in diameter. The length of the tunnel between the centres of the shafts is 805 feet. The pipes are of welded steel, 34 inches in diameter, built in flanged sections, and bolted up in position. The whole of the work was done by contract, with the exception of the fixing of the steel tubes under the Ship Canal and the Mersey. Tenders were invited for this part of the undertaking; but, owing probably to its hazardous and difficult character, the lowest one received was more than double the Engineer's estimate. The Water Committee therefore decided that the work should be carried out by their own staff, with the result that it was successfully completed for considerably less than the estimated amount. The lowest tender was for £4769, and the actual cost was £1405.

The second line of pipes differs from the first in several respects; and Mr. Parry proceeds to point them out. The thickness of the pipes was varied. All the sockets were made heavier, of cast iron, and the use of wrought-iron compression rings was dispensed with. Wherever air-cocks were fixed, the air-cock branch was enlarged into a manway; thus affording, at fairly regular intervals, means of ingress into the pipe for inspection purposes. The main aqueduct valves were constructed in single sluices, and, where necessary, were of the full diameter of the pipe, to enable cleaning to be effected with a turbine brush. Each valve was provided with an indicator gear, showing at the surface the degree of opening of the valve. On the second line of aqueduct, steel was substituted for wrought iron in the construction of all built pipes. Special attention was paid to the coating of the pipes, to protect them against internal corrosion. A new specification was prepared, in which, after careful study of the whole subject, the quality of the pitch and other ingredients was specified, and directions were given as to the method of application. It was also provided that the pipes should be dipped a second time—the mixture of the ingredients being altered for the second bath—and that they should be caused to revolve while in the dipping-pan.

With respect to expenditure, the cost of the second instalment of Vyrnwy water up to the 31st of December last was £607,785; bringing up the total cost of the undertaking, for the first and second instalments, to £2,853,215. The total cost of the Rivington works to the same date was £1,676,841; and the entire capital expenditure on the whole water undertaking was £6,312,113. The total revenue last year from water-rents, rates, and charges, was £311,071; and the total expenditure was £346,302. Of this amount, £229,314 was for interest and sinking fund. The sum standing to the credit of the Rivington works sinking fund on Dec. 31, 1905, was £72,872, and the Vyrnwy sinking fund stood at £165,548. The outstanding capital expenditure is £5,494,141, which includes the cost of the Wallasey pipe-line. In connection with the Rivington supply, the total area of land acquired by compulsory purchase was 5746 acres; and the total cost of the purchase of this land and buildings under the Act of 1902, including legal and other expenses, to the 31st of December last, was £340,464.

The total quantity of water, including compensation water, delivered from the works of the Corporation last year was 17,791,504,000 gallons. The estimated increase of population in the Liverpool district during the year was 9474 persons. The increase in the total quantity of water supplied for domestic and sanitary purposes was 113,399,000 gallons; the increased supply through meters for trade purposes was 58,395,000 gallons; and the quantity supplied in bulk to districts outside the compulsory area was greater in 1905 than in 1904 by 17,409,000 gallons. The average quantity of water consumed per day within the compulsory area was 27,073,000 gallons. The maximum winter consumption in one day was 38,406,000 gallons, and the maximum summer consumption 33,591,000 gallons; while the minimum winter consumption in one day was 18,326,000 gallons, and the minimum summer consumption 19,983,000 gallons. The additional number of new houses and other new premises supplied with water in the Liverpool district during the year was 3472, and water was withdrawn from 896 tenements; the total number of tenants on the rent-roll of the water account at the end of the year being 182,550. The total volume of water distributed during the year was 10,825,394,000 gallons, which was obtained as follows: From Vyrnwy, 4,995,761,000 gallons; from Rivington, 3,893,281,000 gallons; from wells, 1,900,426,000 gallons; and salt water 35,926,000 gallons. The total length of additional distributing and fire mains laid during the year was 11½ miles; and the number of fire hydrants fixed was 283—making the total in the compulsory area 11,301. As to the quality of the water supply, Professor Boyce, F.R.S., reported that its very great bacterial purity was well maintained during the year. The results of his analyses were highly satisfactory.

What is probably the largest single order for gas-engines ever received by one firm is that recently given by the Indiana Pressed Steel Company. It is for eight Westinghouse twin tandem double-acting horizontal engines, each of 3000-horse power, capable of delivering 30,000 cubic feet of free air per minute.

WATER SUPPLY OF BERWICK-ON-TWEED.

The members of the Scottish District of the Association of Municipal and County Engineers held a meeting at Berwick-on-Tweed on the 15th and 16th ult., when a paper read by Mr. R. Dickinson, the Borough Surveyor, revealed a somewhat curious state of affairs as to the water supply existing within the borough. Mr. F. G. Holmes, of Govan, presided in the absence of the President of the Association, Mr. A. E. Collins, of Norwich.

Mr. DICKINSON, in the course of his paper, said: Only the Berwick division of the borough has a public water supply. This was originally provided by the Corporation or Guild from certain springs on the freemen's estate, and was conveyed to various public "pants" by means of wooden pipes. In addition, almost every property had a private well. In 1855, the then Local Board of Health constructed a storage reservoir of 6¼ million gallons capacity on a piece of moorland at New East Farm, about 2½ miles north of the town, at a level of 440 feet above Ordnance datum. The water was conveyed to a service reservoir about ¾ mile from the Town Hall, from which it was distributed throughout the town. Its capacity is 250,000 gallons, and the top water level is 197 feet above Ordnance datum. For this work Mr. (afterwards Sir Robert) Rawlinson was Engineer.

This supply served the purpose until 1870, when the land and springs at the existing Tower Works at Tweedmouth were purchased. These springs yielded 230,000 gallons of water, which flowed daily into the river, over the bottom of what had been a freestone quarry. A reservoir was constructed on the quarry bottom, with three open-jointed sides into the bank from which the springs issued. At a lower level a second reservoir was built, which received its supply from the higher one. From the low reservoir, the water was pumped to the original Castle Terrace reservoir. For this scheme, Messrs. Leslie and Reid, of Edinburgh, were the Engineers. This new supply was used in conjunction with the older one; and, on the lowest estimate, they furnished a daily supply of over 320,000 gallons, for a population of 8000, or 40 gallons per head, and still the demand grew apace.

Before 1890, when the author was appointed, the supply became totally inadequate; and for some years it was impossible to maintain a constant supply during summer months. After much opposition, a Water Committee was appointed. With a strong man at their head, and grasping the situation, they soon justified their existence. A Deacon waste-water meter was procured, which told tales that forced the appointment of an inspector. Regulations became imperative; the Water-Works Clauses Acts were put in force; and slowly but surely the Committee gained ground, and past anxieties began to disappear. Charges for trade supplies, which had long been threatened, did not begin to operate till two years ago. This was vigorously opposed within the authority as well as outside; but there could be no going back. It became a choice between the abolition of meters and an additional supply, and the authority accepted the proper alternative. A charge of 1s. per 1000 gallons was ordered, and this was shortly afterwards reduced to 8d. The revenue derived from this source is only about £350 per annum, partly because no minimum charge has been made for metered supplies. In many cases where supplies are metered, the amount paid for water is less than the meter-rent. The meter used is Kent's "Standard," and its adoption has been fully justified by experience.

Berwick now rejoices in a water supply of over 30 gallons per head, well distributed, and provided with 120 hydrants, but with the serious drawback that it does not reach the highest part of the town, containing some of the best residences. This district has its own supply, but without "head," and consequently would be at a disadvantage in case of fire. While the reorganization of the water system has been pretty thorough, the bed-rock has not yet been reached, and complete satisfaction can never obtain until some method of differentiation is adopted in the rating of trading and domestic premises.

The supply to Tweedmouth is derived from two sources—a private Company and public wells. The Company's supply will not rise to a greater elevation than 35 feet above Ordnance datum; and as part of Tweedmouth rises to a height of over 100 feet, it will at once be seen how partial the supply is. The parts beyond reach of the Company's supply get water by carrying it from public wells, in some cases 300 yards distant. For twenty years Tweedmouth has been trying to obtain a supply. Several attempts have been made, and the advice of as many followed, not excluding the rod diviner. Spittal is in a better position than Tweedmouth for a supply, inasmuch as it is distributed nearly over the township. But it will only rise to a level of about 60 feet; and consequently there is no building development. It is owned by the trustees of a deceased landowner.

After prolonged investigation, the author became satisfied that the probabilities were greatly in favour of additional water being found on the ground of the Berwick Water-Works; but as boring involved considerable risk from two sources, he advised, as a preliminary, that the opinion of an engineer experienced in work of this nature should first be obtained. The matter was referred to Messrs. Read and Waring, who were engaged in carrying out a similar scheme in Lancashire; and, after careful inquiry on the ground, they confirmed the opinion already given, and recommended that a trial borehole should be made to determine the depth of the water-bearing stratum in the first instance, and thereafter to proceed with well-sinking as might be found necessary.

As this borehole was to be sunk on the Berwick Water-Works property, and as there was a prospect of its being utilized in a borough scheme, the three divisions—Berwick, Tweedmouth, and Spittal—agreed that the work should be carried out at their joint expense. Local Government Board sanction was readily obtained to borrow £500 for the work; and Mr. John Thom, of Patricroft, the selected contractor, commenced operations forthwith. No water was met with until a depth of 282 feet had been attained; and at 299 feet the water rose to within 2 ft. 6 in. of the surface. In the expectation of the water overflowing the surface, boring was continued until 413 feet was reached. But, excepting a 3½-feet band of sandstone, nothing but clay was penetrated.

The borehole commenced with a diameter of 9 inches for 30 feet, and was gradually reduced to 5 inches in the water-bearing rock. It was lined throughout; but for 40 feet, where the water was found, the tubing was perforated to admit the water. The Local Government Board stipulated, among other things, that the borehole should be tested for a fortnight by continuous pumping; and before this test was begun, the borehole was securely plugged with 50 feet of milled clay at the bottom.

An air-compressor plant was employed for the test. The water was discharged over a weir 12 inches in length; and on the thirteenth and fourteenth days the flow remained steady, at a depth of 2 7/16 inches; being equal to 175,000 gallons per 24 hours. As the surface of the borehole was only 10 feet above high water, samples of water from it were taken at both states of the tide; and the analyses proved it to be in every way satisfactory. The quantity obtained from so small a bore exceeded the most sanguine expectations, while the existing supply had not been affected in the slightest degree.

The result was deemed so satisfactory that the Engineers were instructed to prepare a scheme for the supply of the whole borough. It was to combine the existing supply and that from the borehole; and instead of pumping the water to Berwick, to pump it to a reservoir to be constructed in Tweedmouth, where a site could be obtained about 100 feet higher than the Castle Terrace reservoir, which would provide head to gravitate the supply to any part of the borough.

The present pumping main was to be extended, and utilized for delivering water from the new reservoir to the existing Castle Terrace reservoir for the supply of Berwick. As the new reservoir was intended to contain three days' supply for the whole borough, and the Castle Terrace reservoir could only hold one day's supply for Berwick alone, Berwick would be safeguarded against the existing risk of the supply being cut off in case of a breakdown of machinery. Separate pipes would convey water to Tweedmouth and Spittal, where it would be properly distributed, and this would have provided, in one establishment, a thoroughly compact and efficient water supply for the whole borough. The authority's instructions were fully complied with; and the estimated cost of the work is £20,000. In January last, at a meeting of 18 out of 24 members, eight voted for and nine against the scheme, and one declined to vote. The position to-day is that, on the recommendation of the Spittal representatives, the authority has decided, subject to the approval of the Local Government Board, to purchase, for the use of Spittal alone, the Spittal Water-Works, and the farm on which they are situated, at a cost of £8000. Tweedmouth remains, as before, in urgent need of a supply with no prospect of its acquisition.

In the course of the discussion upon the paper,

Mr. LEE (Paisley) said he could hardly imagine how it was possible to get a satisfactory administration of the water supply with three different authorities controlling it; and his opinion was that it should be under the control of the Local Authority. He noticed that they charged for water on the full rateable value of the premises for domestic supply; but if the occupier of any mill or workshop required a supply by meter, he had to pay for it in addition. All he (Mr. Lee) could say was that they were very lucky to get it, for in Paisley they would not. They did not charge the domestic rate on works. They put on a merely nominal rate of 1d. in the pound, and then charged for the water by meter. To charge two rates was very unfair. He noticed that at Berwick they were proposing to get a supply of water from a borehole. He thought, in every case where it was possible, it should be obtained from a gathering-ground and stored in a reservoir.

Mr. SMITH (Arbroath) supported the remarks of the previous speaker in regard to the double charge made when water was supplied by meter. He noticed that the Kent meter was universally adopted in Berwick, and said he should like to ask Mr. Dickinson if he found it as accurate for registering small as for large quantities.

Mr. WILSON (Helensburgh) said the minimum charge for water supplied by meter should be not less than £2 per annum. With regard to the three different sources of water supply, he thought there should be one supply, and a uniform charge for the water throughout the districts. Under the present system, he did not see that Mr. Dickinson had the power of properly controlling any waste water.

Mr. CURRY (Pretoria) asked Mr. Dickinson as to the quantity of water he was expecting to get from the borehole. In South Africa they wanted a number of boreholes, and had to get their water as best they could. If they could secure an adequate supply from a borehole, he thought it preferable to any gathering-ground.

Mr. GOUDIE (Stirling) said last summer they had to supplement their supply, obtained from a gathering-ground, by water from springs; and their experience was that the water so obtained was not satisfactory, and they had several complaints. The water was pure, but very much harder than that obtained by gravitation; and the result was that they had to close it off as soon as possible. As to charging by meter and rate as well, in Stirling they were pretty much in the same position as Paisley. In cases where they supplied by meter, they charged only a rate of 1d. Having three different water supplies must cause great trouble to the engineer, and could not be in any way satisfactory to the inhabitants.

Mr. BRYCE (Partick) said it would seem perfectly reasonable and fair that the three divisions of the borough should combine in one large scheme, and have one uniform rate of assessment. It would certainly make things much easier, would be more economical to the ratepayers, and better for the town.

Mr. DICKINSON, in reply, said the feature of the supply of water obtained from the borehole was its steadiness. In winter or summer, wet or dry, the yield never varied from about 200,000 gallons per day from a 5-inch borehole. From this they got as much water as they required for the whole borough; and the sinking of a well could be dispensed with. But by one vote in the Council, the scheme was overturned. He agreed with Mr. Wilson that there should be a minimum rent for water supplied by meter; and he had been agitating for it.

A vote of thanks was accorded to Mr. Dickinson for his paper.

PORTADOWN AND BANBRIDGE WATER SUPPLY.

The Mourne Scheme.

The first section of the scheme for obtaining water from the Shimna River, in the Mourne Mountains, for the towns of Portadown and Banbridge, has now been completed; and the opening ceremony, which took place about a fortnight ago, was the occasion of much mutual congratulation. The water supply question has long been a pressing one at Portadown; and even when investigations proved that an abundant quantity of most excellent water could be obtained from the Shimna, it was feared that the cost would be prohibitive. This difficulty, however, was ultimately surmounted by the Urban District Councils of Portadown and Banbridge agreeing to combine; and a Joint Water Board was thereupon formed to carry out the scheme, the first section of which has been finished. Altogether the works are estimated to cost about £70,000. The contract for the pipe-line and the construction of the service reservoirs at Portadown and Banbridge was given to Messrs. Collen Bros., of Portadown, who, it is stated, carried out the work in a very expeditious and satisfactory manner.

The water was turned on at the two reservoirs by means of solid gold keys, suitably inscribed, which were presented by the Contractors. The ceremony at Banbridge was performed by Mr. J. M'Ilroy, and that at Portadown by Mrs. Johnston, wife of Mr. Charles Johnston, J.P., the Chairman of the Joint Water Board. Afterwards, on the invitation of Mr. Johnston, a large party sat down to lunch at the Portadown Town Hall. The Engineers to the scheme were Messrs. Swiney and Dorman; and, replying to a toast, the former gentleman said it might be interesting to give the cost per 1000 gallons of the water supply under the joint scheme, as compared with other towns. In London, the cost per 1000 gallons was 8d.; in Liverpool, 6¾d.; in Manchester, 5⅜d.; in Birmingham, 8½d.; in Glasgow (which had great natural facilities) 2½d.; and in Dublin, 3½d.—as against their scheme, which would amount to 2½d. per 1000 gallons. They would, he was sure, agree that this was a most satisfactory solution.

Proposed Reduction at Stratford-on-Avon.—At the last meeting of the Stratford-on-Avon Town Council, a proposal by the Gas Committee to reduce the price of gas by 2d. per 1000 cubic feet as from Sept. 30 next was objected to by Mr. Winter, who, in his capacity as Chairman of the Finance Committee, said the matter should have first come before his Committee. It would make a difference of £425 in the income. Ultimately the matter was referred to the Finance Committee.

Yorkshire v. Durham Gas Coal.—The "Shipping Gazette" says: Yorkshire has proved an active competitor in the gas-coal trade this year. During the French strike, Yorkshire gas coals established themselves in favour by reason of the lower prices at which they were offered as compared with the Durham product. Further, in the case of several other contracts during the half year, Yorkshire coals made a good show, and carried off business which had hitherto always been held by Durham producers. Now comes news of the Drammen Gas-Works contract (Norway), which it is announced has been closed for Yorkshire coals at 9s. 1d. per ton f.o.b., including tax. The quantity is only small, it is true, amounting to some 2000 tons; but hitherto the business has always gone to Tyneside tenderers, whose prices this year appear to have put them out of the running.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

At the meeting of the Hamilton Town Council on Tuesday, the Gas Committee reported that the accounts of the Gas Department for the year showed a gross profit of £5119, and that, including a sum of £1823 brought forward, there was a net balance of £3768. The Gas Committee recommended the carrying forward of this sum. They had considered proposals for supplying gas-cookers free and reducing the price of gas. The forecast for the current year showing an expected minimum gross profit of £4503, the Committee agreed, by a majority, to recommend that the price of gas supplied through prepayment meters at 2s. 11d. per 1000 cubic feet should be reduced by 2d., that for gas supplied through prepayment meters at 2s. 6d. there should be a reduction of 1d.; and that otherwise the price to ordinary consumers should be continued at 2s. 1d., and for power at 1s. 10½d. The Committee agreed to delay consideration of the proposal as to free cookers. They recommended an increase of £30 to the salary of Mr. J. Ballantyne, the Manager, and of £13 to Mr. Robb, the Assistant-Manager. Bailie Hamilton, the Convener of the Committee, in submitting the report, said that everything they had undertaken last year they had been successful in carrying through a little more favourably than they had anticipated. The quantity of gas consumed showed a considerable increase. The financial position was also good; the results for the past year being all on the right side. A division took place on the question of the increases; but the recommendations of the Committee were adopted by 13 votes to 2. On the subject of the price of gas, Bailie Hay moved that the reduction be 1d. per 1000 cubic feet to every class of consumer. He was, he said, opposed to the suggested legislation for a class. Mr. Slorach thought there was a misunderstanding as to the two classes of consumers by prepayment meters. The price of 2s. 6d. was to cover the cost of collection and of the meters; while the 2s. 11d. had to cover also the cost of piping in houses where there were no fittings. He thought this was on a very equitable footing. Provost Keith said he was disposed to stand by the report. The question was whether the two prices of 2s. 6d. and 2s. 11d. were in fair relationship as between the cost of gas and the price paid for the particular way in which gas was delivered to a consumer. During the past year, complaints and very strong representations had been made to them as to the distinction in the price. When they went into the matter, some three months ago, they considered whether the distinctions were as near the mark as they could be; and they satisfied themselves that the basis had been fairly struck. It was, however, with the view of meeting certain objections which had been urged that the two prices were proposed to be now reduced, so that they might truthfully say that no one was paying a penny more for gas through a prepayment meter than an ordinary consumer. He did not think they should reduce the price to the ordinary consumer at the present time. They had to-day the cheapest gas in Scotland, and he held that, without granting any further reductions, they were satisfying all the legitimate requirements of the various classes. Mr. Cassells asked how much it would require to reduce the price to ordinary consumers by 1d. per 1000 cubic feet, in addition to the two proposals in the report. Bailie Hamilton said that this would take £400. Mr. Cassells said he was inclined to support the amendment.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 160.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Apl. 11	10½	Alliance & Dublin 10 p.c.	20—21	..	5 0 0
160,000	10	,,	7½	Do. 7 p.c.	14½—15½	..	4 16 9
200,000	5	May 11	7	Bombay, Ltd.	6⅞—7¼	..	4 16 7
40,000	5	,,	7	Do. New, £4 paid	4¾—5¼	..	5 6 8
50,000	10	Mch. 9	14	Bourne-mouth Gas & Water 10 p.c.	28½—29½	..	4 14 11
51,810	10	,,	7	Do. B 7 p.c. Pref. 6 p.c.	17—18	+⅛	3 17 9
53,200	10	,,	6	Brentford Consolidated	15—16	..	3 15 0
380,000	Stk.	Feb. 22	12½	Do. New	263—268	..	4 13 3
300,000	,,	,,	9⅜	Do. 5 p.c. Pref.	200—205	..	4 12 8
50,000	,,	,,	5	Do. 4 p.c. Deb.	123—128	..	3 16 11
206,250	,,	June 14	4	Brighton & Hove Orig.	103—106	..	3 15 6
220,000	Stk.	Mch. 9	11¼	Do. A. Ord. Stk.	230—235	..	4 15 9
246,320	,,	,,	8¼	British	165—170	..	4 17 1
460,000	20	Apl. 11	10	Bromley, Ord. 5 p.c.	42—43	..	4 13 0
100,000	Stk.	Feb. 22	6	Do. do. 3½ p.c.	121—124	..	4 16 9
165,700	,,	,,	4½	Buenos Ayres (New) Ltd.	92—95	..	4 14 9
500,000	10	May 11	7	Do. 4 p.c. Deb.	11½—12	−¼	5 16 8
250,000	Stk.	June 28	4	Cagliari, Ltd.	96—98	..	4 1 8
150,000	20	July 12	8¼	Cape Town & Dis., Ltd.	24—26*	+½	6 6 11
100,000	10	June 14	10	Do. 4½ p.c Pref.	15⅝—16⅞	..	6 1 3
100,000	10	Apl. 26	4½	Do. 6 p.c. 1st Mort.	9⅝—10¼	..	4 7 10
50,000	50	May 2	6	Do. 4½ p.c. Deb. Stk.	52—54	..	5 11 1
50,000	Stk.	June 28	4½	Commercial 4 p.c Stk.	98—100	..	4 10 0
1,443,280	Stk.	Feb. 22	5⅛	Do. 3½ p.c. do.	113—115	..	4 10 5
560,000	,,	,,	5	Do. 3 p.c. Deb. Stk.	110—112	..	4 9 3
475,000	,,	June 14	3	Continental Union, Ltd.	84—86	..	3 9 9
800,000	Stk.	,,	6½	Do. 7 p.c. Pref.	124—127	−1	5 2 4
200,000	,,	,,	7	Derby Con. Stk.	140—145	..	4 16 7
432,070	Stk.	Feb.	5½	Do. Deb. Stk.	122—124	..	4 8 9
55,000	,,	Jan.	4	European, Ltd.	105—107	..	3 14 9
486,090	10	Jan. 25	11	Do. £7 10s. paid	24½—25½	..	4 6 3
354,060	10	,,	11	Gas-light and Coke 4 p.c. Ord.	18½—19½	..	4 4 8
15,223,235	Stk.	Feb. 8	4⅛	Do. 3½ p.c. max.	98—99	..	4 8 11
2,600,000	,,	,,	3½	Do. 4 p.c. Con. Pref.	88—90	+1	3 17 9
3,799,735	,,	,,	4	Do. 3 p.c. Con. Deb.	108—111	..	3 12 1
4,193,975	,,	June 14	3	Hastings & St. L. 3½ p.c.	86—88	..	3 8 2
258,740	Stk.	Mch. 9	5	Do. do. 5 p.c.	100—105	..	4 15 3
82,500	,,	,,	6⅔	Hongkong & China, Ltd.	121—124	..	5 4 10
70,000	10	Apl. 11	11	Imperial Continental	20—21	..	5 4 9
4,940,000	Stk.	May 11	8	Do. 3½ p.c. Deb. Red.	177—179	..	4 9 5
473,600	Stk.	Feb. 8	3½	Lea Bridge Ord. 5 p.c.	96—98	..	3 11 5
175,242	Stk.	Mch. 28	6	Liverpool United A	121—126	..	4 15 3
561,000	Stk.	Feb. 22	10		235—237	..	4 4 5

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
718,100	Stk.	Feb. 22	7	Liverpool United B	169—171	..	4 1 10
306,083	,,	June 28	4	L'rpool Unit'd Deb. Stk.	107—109	..	3 13 5
75,000	5	June 28	5	Malta & Medn., Ltd.	4¼—4⅝	..	5 5 3
560,000	100	Apl. 2	5	Met. of 5 p.c. Deb.	103—105	..	4 15 3
250,000	100	,,	4½	Melbourne 4½ p.c. Deb.	102—104	..	4 0 7
541,920	20	May 31	3½	Monte Video, Ltd.	11—12	..	5 16 8
1,675,892	Stk.	Feb. 22	4½	Newc'tle & G'tesh'd Con.	110—112	..	4 2 7
406,025	Stk.	June 29	3½	Do. 3½ p.c. Deb.	97—99	..	3 10 8
15,000	10	Mch. 9	10	North Middlesex 10 p.c.	19½—20½	..	4 17 7
52,940	10	,,	7	Do. 7 p.c.	13—14	..	5 0 0
300,000	Stk.	May 11	8	Oriental, Ltd.	147—150	..	5 6 8
600,000	5	Mch. 28	7	Ottoman, Ltd.	6—6¼	..	5 7 8
398,490	5	Apl. 26	7	Primitiva Ord.	6¼—6⅝	..	5 3 8
796,980	5	Jan. 25	5	Do. 5 p.c. Pref.	5⅛—5⅜	..	4 13 0
488,900	100	June 1	4	Do. 4 p.c. Deb.	95—97	..	4 2 6
851,070	10	Apl. 26	7	River Plate Ord.	12⅛—12¾	..	5 9 10
300,000	Stk.	June 28	4	Do. 4 p.c. Deb.	96—98	..	4 1 8
250,000	10	Mch. 28	8	San Paulo, Ltd.	13½—14	−¼	5 14 4
70,000	50	July 2	5	Do. 5 p.c. Deb.	49—51	..	4 18 0
135,000	Stk.	Mch. 28	10	Sheffield A	244—246	..	4 1 4
209,984	,,	,,	10	Do. B	243—245	..	4 1 8
523,498	,,	,,	10	Do. C	243—245	..	4 1 8
126,106	Stk.	Mch. 9	5½	Shrewsbury Ord. 5 p.c.	114—116	..	4 14 10
70,000	10	May 31	10	South African	15⅜—16⅜	..	6 1 3
6,250,000	Stk.	Feb. 22	5½	South Met., 4 p.c. Ord.	129—131	+1	4 4 0
1,895,445	,,	July 12	3	Do. 3 p.c. Deb.	86—88*	+½	3 8 2
575,000	Stk.	Mch. 9	5½	S'th Suburb'n Ord. 5 p.c.	122—125	+2	4 8 0
60,000	,,	,,	5	Do. 5 p.c. Pref.	125—130	..	3 16 11
112,533	,,	July 12	5	Do. 5 p.c. Deb. Stk.	130—135*	..	3 14 1
502,310	Stk.	May 11	5	Southampton Ord.	107—112	..	4 9 3
120,000	Stk.	Mch. 9	6¼	Tottenham A 5 p.c. and B 3½ p.c.	124—127	..	4 18 5
363,020	,,	,,	4½		99—102	..	4 13 2
137,500	,,	June 28	4	Edmonton 4 p.c. Deb.	103—105	..	3 16 2
182,380	10	June 14	8	Tuscan, Ltd.	10—10½	..	7 12 5
149,900	10	July 2	5	Do. 5 p.c. Deb. Red.	98—101	..	4 19 0
30,000	Stk.	Feb. 22	7½	Wands-worth A 5 p.c. and B 3½ p.c. and C 3½ p.c.	—	..	—
255,636	,,	,,	6¼		133—136	..	4 11 11
75,000	,,	,,	5⅝		110—113	..	4 16 1
69,416	,,	June 28	3	Putney 3 p.c. Deb. Stk.	82—85	..	3 10 7
745,872	,,	Mch. 9	5⅜	West Ham 5 p.c. Ord.	106—108	..	4 14 10
185,000	,,	,,	5	Do. 5 p.c. Pref.	122—125	..	4 0 0
193,300	,,	June 28	4	Do. 4 p.c. Deb. Stk.	104—107	..	3 14 9

Prices marked * are "Ex div.

Mr. Brown moved that the price of gas be reduced by 2½d. all round. This proposition, however, was not seconded; and the recommendations of the Committee were adopted.

The Stirling Gas Company held their annual meeting on Tuesday—Mr. J. Johnston in the chair. The Directors, in submitting the audited accounts for the year, called attention to the following points: The expenditure on account of capital had amounted to £3385, and was incurred particularly on new mains and services and additional stoves and meters. The net profit for the year, after providing for the payment of the renewal of plant and mains, was £5048. To this had to be added £1027 brought forward; and, after payment of interest on mortgages, income-tax, and dividend on preference shares, amounting (less interest received) to £1063, there remained a balance of £5012 at the credit of the profit and loss account. The Directors recommended the payment of a dividend on the original capital at the rate of 9s. 5·5134d. on each share of £5 7s. 6d., and on the new ordinary shares at the rate of 11s. per share on each £10 share, amounting together to £4041, less income-tax. They also recommended that a further sum of £600 be carried to the insurance fund, making it, with the accrued interest, £2282; that £184 be carried to a reserve fund, in terms of the Company's Acts; and that the balance of undivided profits, amounting to £390, be carried forward. The Chairman said it was very gratifying to the Directors, and he was sure it must also be to the shareholders, that the undertaking was prospering and still increasing. The consumption of gas for the past year was 100,572,000 cubic feet, compared with 51,546,000 cubic feet nine years ago, or nearly double what it was when they were in negotiation with the Town Council for the sale of the works. Consumers, also, were increasing in fair proportion to the growth of the population. The use of gas for cooking was now a great factor in equalizing the consumption. The number of cookers in use at the close of the year was 992—an increase of 432—and of grillers 217, besides other smaller appliances. Altogether, there were now 930 grillers in use in the district. Prepayment meters were still in great demand. Of these, 1834 were in use—an increase of 310 over the previous year; and the remarkable sum of £2621 was taken from them in pennies—an increase of £560. The sulphate plant was also giving satisfactory results, the additional revenue from residuals having been £761, solely due to the introduction of this plant, which had in one year more than paid the cost of its erection. The report was adopted.

The annual meeting of the Cupar Gas Company, Limited, the report of the Directors of which was referred to last week, was held on Thursday—Mr. W. Honeyman, of Craigmore, in the chair. The Chairman said they had had a fairly satisfactory year, and had made some progress. The increase in sales last year was £222 over the previous year. This was made up by an addition of 173 ordinary and 47 prepayment meters. There had also been an increase from some of the residual products. While in the last year they supplied the County Asylum with gas their output was 22 million cubic feet, in the past year it was 24 millions. The Directors did not see their way to suggest a general reduction in the price of gas, but they proposed to allow an additional 2½d. discount on all ordinary accounts of £15 and upwards. The report was adopted.

At the meeting of the Broughty Ferry Town Council on Monday, Bailie Godfrey, the Convener of the Finance Committee, said that in the Gas Department they estimated for a consumption of more than 52 million cubic feet; and they had exceeded their estimate by 609,310 cubic feet. They estimated for a surplus of £640; but the actual surplus had been £1468, or £828 better. The sum of £256, the proportion for extension of works arranged to be paid off in ten years, had not been charged to revenue, as estimated; but, owing to the Scotch Office insisting upon their paying income-tax and sinking fund upon this, the expenditure for these extensions had been carried to the capital account. The effect of this would be to make the time shorter for requiring to keep up the price of gas at 3s. 6d. per 1000 cubic feet. Their actual surplus, therefore, was £1468. Out of it they would repay £1200 of what was commonly known as the Castle Green Fund. The rest of this fund would be repaid when opportunities for borrowing occurred again. Bailie Crystal added that they had got £1100 for coke, against an estimate of £800; while the estimated return from sulphate was £600, and they had realized £662. Their Manager had always succeeded in getting top prices. In considering the estimates for the current year, Bailie Godfrey said they could not hold out any hope of a reduction in price. The total deficit they had originally was £4400, to which had to be added £1461 of a deficit in the Electricity Department—in all, £5861. Of this amount there had already been repaid £3230 by the Gas Department. All were glad that they were so near the clearing off of this unfortunate burden. In the Electricity Department there was a deficit of £73, which was, however, £33 better than was estimated.

At the meeting of the Dunfermline Town Council on Monday, it was agreed, on the recommendation of the Gas Committee, to give an annual donation of £2 10s. to the Special Purposes Fund of the Institution of Gas Engineers.

The Grangemouth Town Council have this week agreed to a proposal by the Lighting Committee that 110 of the street-lamps, which have at present globe lanterns, should be fitted with lanterns of square pattern. Mr. White, the Convener, said they found the globe lanterns to be very expensive, as the wind got into them and broke the mantles. He had seen the Gas Engineer of the Edinburgh and Leith Gas Commissioners, who had recommended the inverted burner, because it did not cast any shadow, and required only 2¼ cubic feet of gas per hour. It was remitted to the Committee to consider this suggestion.

It is strange that it is in the smaller towns that the automatic system of lighting and extinguishing gas-lamps is finding most favour. The town of North Berwick, where the gas supply is in the hands of the Corporation, possesses such an installation; and now I learn that in Stonehaven, where the gas is supplied by a Company, the Town Council have resolved to introduce the system. It has been agreed to fit with such apparatus 18 of the street-lamps, 13 of which are to be all-night lamps. Bailie T. Mitchell, the Convener of the Lighting Committee,

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said they were of opinion that the system would be very useful, especially in connection with all-night lamps, which cost a good deal to extinguish. The outlay would be about £9; but the apparatus would repay itself in a few years.

The Markinch Gas Company, at their annual meeting on Tuesday, agreed to a dividend of 5 per cent.—the usual rate. The meeting confirmed the reduction in the price of gas from 4s. 7d. to 4s. in summer and 4s. 4d. during the remainder of the year. Five years ago the price of gas was 5s. 5d., and the dividend to the shareholders has never been higher than 5 per cent. A new gasholder and tank, and a new exhauster, bought last year, cost £1500. Considering these extensions, and the extra work thrown upon Mr. A. Scott, the Manager, a bonus was voted to him.

The Kirriemuir Gas Company, Limited, held their annual meeting on Thursday, and a dividend at the rate of 6 per cent. was declared. The price of gas to ordinary consumers was continued at 4s. 7d. per 1000 cubic feet, with 5 per cent. discount for payment within a month, and a reduction of 20 per cent. was made on cooker rents. It was intimated that an arrangement had been come to with the Town Council for the repair of street-lamps being placed with the Company.

The Laurencekirk Gas Company on Wednesday declared a dividend of 5 per cent. The meeting confirmed the decision of the Directors to supply gas for all purposes from May to November at 5s. per 1000 cubic feet. The price otherwise is 6s. 8d.

At the annual meeting of the Jedburgh Gas Company last Wednesday, it was resolved to declare a dividend of 6s. per £6 share; and a credit balance of £32 was left. Writing of Jedburgh, I may say that for the second time the Electric Light Company have submitted their annual report to the Town Council, and their figures show a debtor balance of £190 on the working expenses alone, not to mention a capital outlay of upwards of £11,000.

CURRENT SALES OF GAS PRODUCTS.

Week ending July 14.

The London market for coal tar products has been without variation during the past week. Makers remain firm in their view of the future value of pitch, and are content to wait for development after the shipping season has re-opened. Sulphate of ammonia declined at the beginning of the week, and there were reports of sales at reduced figures; but at the close the tone had improved. The official quotation for Beckton make is £11 17s. 6d. per ton.

Sulphate of Ammonia. LIVERPOOL, *July* 14.

When it became known that the exports for June exceeded those for the same month of last year by nearly 3000 tons, it was expected that the market would assume a better tone. Although the parcels offered have found a fairly ready sale, no advance was scored in prices, which remain £11 12s. 6d. per ton f.o.b. Hull, and £11 15s. per ton f.o.b. Liverpool. At the latter figure, business has also been done f.o.b. Leith. In forward delivery, more interest has been displayed by buyers; but as the majority of makers held to their previous quotations of about £12 5s. per ton f.o.b. at shipping ports for delivery into next year, little actual business has resulted.

Nitrate of Soda.

The market continues firm, and cargoes for Spring delivery are worth rather over 11s. per cwt. Quotations on spot remain at 11s. 1½d. to 11s. 4½d. per cwt., according to quality.

Tar Products. LONDON, *July* 14.

The market for tar products is quiet, but fairly firm. In pitch, most of the manufacturers now appear to have cleared out whatever quantities they desired to place for prompt delivery; and as regards forward, they are very firm in their ideas. The principal London distillers still quote 32s.; but they have not yet been able to do business at this price. It is reported that 28s. 6d. has been paid in the North for delivery from September to the end of the year; and some of the manufacturers in this district seem to be inclined to accept this price. The Yorkshire manufacturers appear to be fairly well sold, and do not seem inclined to consider any further business until they have renewed some more of their tar contracts. The South Wales buyers appear practically out of the market for delivery to the end of the year, and it is not probable that anything but a low price would tempt them to buy; but they appear disposed to do business for January-June next year, for which period, however, makers will not quote just now. There is very little demand from the Continent, where consumers seem to think that they will do better by waiting. In creosote, the market is practically unchanged. London manufacturers still ask high prices; and there is evidently a good demand for export in barrels at figures which are more remunerative than ordinary bulk business. As regards the Midlands and the North, the market is steady, but there is not much business reported. It would appear that this article, which was previously overstocked, is now rather more scarce; a fair amount of business having been done which has cleared out the quantities that makers were anxious to sell. The anthracene market remains in about the same position. Small parcels of moderate quality have changed hands at 1⅜d. to 1½d. per unit; but it is reported that small transactions in high-quality anthracene have realized nearly 2d. As regards the inferior makes, there is practically no demand at all for them. Solvent naphtha remains quiet. Some of the makers appear willing to do business for forward delivery at present prices, and in more than one instance they have shown a willingness to sell for delivery all over next year; but for prompt delivery in London fair prices are still being paid. Carbolic acid remains unchanged; but the German manufacturers do not appear inclined to offer above 1s. 9d. on the east coast, which price it is out of the question to get distillers to accept. As regards crystals, it is almost impossible to ascertain the actual value

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MAXIM PATENT CARBURETTOR
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PREVENTS NAPHTHALENE DEPOSITS.
OVER 120 MAXIM PATENT CARBURETTORS HAVE NOW BEEN FIXED.
Among the Companies and Towns supplied are The Gaslight and Coke Company, Manchester, Exeter, Birmingham, Leeds, Rochdale, Bristol, Sheffield, Oldham, Dundee, Perth, Dunfermline, and many other Works, both large and small, where they have been working in some instances for the past Ten Years.
MORE GAS & SALEABLE COKE PER TON of COAL CARBONIZED is PRODUCED; SAVING CAPITAL, LABOUR, FUEL, WEAR & TEAR, &c.
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The Carburettor is inexpensive, easily fixed, and entirely supersedes the use of Cannel.
Dealers in Benzol, Carburine, and all other Naphthas and Oils suitable for the Enrichment or Production of Gas.
For Prices and full Particulars, apply to
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of this article. For some time past the nominal quotations have remained unchanged at 6d. for 39-40 per cent. and 5¾d. for 34-35 per cent.; but there is little or no business doing. Toluol remains firm. The small quantities which offer are readily placed at fair prices, and 11d. naked has been offered and refused in the Midlands for delivery to the end of the year; while 1s. 1½d. to 1s. 2d. may be taken as the ruling London price. Benzol 90 per cent. is quiet, and more than one manufacturer appears inclined to place some quantity for delivery to the end of the year; but in 50-90 per cent. the market is very firm. There is not much offering; and it is reported that 11d. has been paid for a small quantity. In tar, one or two contracts of fair importance have to be decided during this week; while it is reported that a small quantity has been renewed in Yorkshire at from 18s. to 19s. per ton.

Average values during the week were: Tar, 15s. to 20s. Pitch, London, 27s. 6d.; east coast, 26s. 6d.; west coast, 25s. 6d. to 25s. 9d. Benzol, 90 per cent., 9¼d. to 9½d.; 50-90 per cent., 10⅜d. to 11d. Toluol, 1s. 1½d. to 1s. 2d. Crude naphtha, 3⅜d. to 4d.; solvent naphtha, 1s. 1d. to 1s. 1½d.; heavy naphtha, 11½d. to 1s. Creosote, London, 1 1/16d. to 2d.; North, 1⅛d. to 1⅜d. Heavy oils, 2¼d. Carbolic acid, 60 per cent., 1s. 9d. to 1s. 9½d. Naphthalene, £4 10s. to £9 10s.; salts, 25s. Anthracene, "A" quality, 1½d. to 1⅝d.; "B" quality, unsaleable.

Sulphate of Ammonia.

The market remains exceedingly quiet; and so far as prompt delivery is concerned business, can only be done at low prices. But there appears to be a slightly improved demand for forward delivery, though makers do not appear disposed to do business except at a considerable advance on existing prices. The principal London Gas Companies still quote £12; but the nominal value may be taken as £11 10s. to £11 12s. 6d. So far as Hull is concerned, there is not much business to report; and the value may be taken as £11 11s. 3d. to £11 12s. 6d. An important maker who ships from this port states that he sold a parcel by tender a few days ago at a price considerably in advance of the market quotation; but this was for a very fine make, which generally commands a premium. In Liverpool, the market is quiet at £11 12s. 6d. to £11 13s. 9d.; while in Leith, there is little or no business doing. Makers are not prepared to consider the prices indicated by buyers; and the market closes dull at about £11 15s. at this port.

Fatal Gas Explosion in Glasgow.—On the evening of Thursday, the 5th inst., a young man, named Archibald Tonge, residing in Hampden Terrace, Mount Florida, Glasgow, was injured by an explosion of gas which occurred in the house. The family were on a holiday; and on the young man visiting the house he detected a smell of gas in the dining-room. He took a light to locate the leak, and this led to an explosion, by which he was severely burnt about the body, arms, and face, and considerable damage, estimated at about £50, was done in the room. The young man died of his injuries on Saturday.

COAL TRADE REPORTS.

Lancashire Coal Trade.

Owing to the general conditions of the staple industries of Lancashire, the coal trade is relatively better at the present time than for many summers past. Most collieries are working full time, the number of hands employed being above the average. The volume of trade excites a feeling among the miners that their wages should be increased; and there is no doubt that their application for better pay will be formulated when their leaders feel that the proper time to do so has arrived. The coal market is steady. Average quotations at the pits are: Best house coal 13s. to 14s., secondary 12s. to 13s., common 9s. to 10s., steam and forge 8s. to 9s., best engine fuel 7s. 6d. to 8s. 6d., best slack 6s. 9d. to 7s. 6d., medium 6s. to 7s., common 5s. to 6s. Coal for shipping on the Manchester Ship Canal is 9s. 6d. to 10s. 6d.

Northern Coal Trade.

There has been some enlargement in the demand for coals, and the shipments continue at a very heavy rate, so that the output is well taken up for this season of the year. This seems likely to continue, unless there should be a lull prior to the end of the period of the coal tax. In the steam coal trade, there is a steady inquiry; and the best Northumbrian steams are quoted from about 10s. 6d. per ton f.o.b. Second-class steams are from 9s. 6d. to 9s. 9d., and steam smalls are 6s. to 6s. 3d.—the latter kind being rather scarce still. No new contracts of moment are reported for steam coals. In the gas coal trade, the inquiry is beginning to show a more perceptible rate of increase as the days begin to shorten. The demand is most marked for the best kinds of gas coals. Prices for occasional cargoes vary from about 9s. to 10s. 3d. per ton f.o.b., according to quality. One or two contracts have been determined, though not for heavy quantities; but it is significant that, in another instance, a foreign contract which has long been sent to Durham has this year gone to another district quoting lower prices—a fact that should influence prices here, for it is one of several this season. In the coke trade, the tone is steady, so that gas coke is a little influenced in sympathy. The production is still limited of gas coke, which is quoted from 10s. to 10s. 6d. per ton, f.o.b. on the Tyne, for good qualities.

Scotch Coal Trade.

Dulness has been the characteristic of the coal trade for the week, especially in the home department. The export trade is brisk, and promises well. In the home market, there is not the elasticity which is desired. The prices quoted are: Main 7s. 9d. to 8s. per ton f.o.b. Glasgow, ell 8s. 9d. to 10s., and splint 9s. 3d. to 9s. 6d. The shipments for the week amounted to 284,839 tons—a decrease of 37,006 tons upon the preceding week, but an increase of 19,376 tons upon the same week of last year. For the year to date, the total shipments have been 6,948,003 tons—an increase of 784,583 tons upon the corresponding period of 1905.

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The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

	Cub. Ft. Daily.		Cub. Ft. Daily.		Cub. Ft. Daily.
Blackburn	1,250,000	Winnipeg, Man.	500,000	Malton	150,000
Windsor St. Works, Birmingham	2,000,000	Colchester (Second Contract)	300,000	Smethwick	500,000
Saltley Works, Birmingham	2,000,000	York	750,000	Gravesend	300,000
Colchester	300,000	Rochester	500,000	Pernambuco, Brazil	125,000
Birkenhead	2,250,000	Kingston, Ont.	300,000	Duluth, (Second Contract)	300,000
Swindon (New Swindon Gas Co.)	120,000	Crystal Palace District	2,000,000	Leicester (Second Contract)	1,000,000
Saltley, Birmingham (Second Contract)	2,000,000	Duluth, Minn.	300,000	Newport (Second Contract)	250,000
Windsor St., Birmingham (Second Contract)	2,000,000	Caterham	150,000	Brockville	250,000
Halifax	1,000,000	Leicester	2,000,000	Toronto (Third Contract)	750,000
Toronto	250,000	Enschede, Holland	150,000	Montreal, Ont. (Second Con.)	1,800,000
Ottawa	250,000	Buenos Ayres (River Plate Co.)	700,000	Toronto (Fourth Contract)	1,000,000
Lindsay (Remodelled)	125,000	Burnley	1,500,000	Hamilton, Ont.	400,000
Montreal	500,000	Kingston-on-Thames	1,750,000	Rochester (Third Contract)	1,600,000
Toronto (2nd Cont., Remodelled)	2,000,000	Accrington	500,000	Leeds (Second Contract)	900,000
Belleville	250,000	Tonbridge	300,000	Buenos Ayres (Primitiva Co.)	1,200,000
Ottawa (Second Contract)	250,000	Stretford	500,000	Buenos Ayres (New Co.)	1,200,000
Brantford (Remodelled)	200,000	Oldbury	300,000	Christchurch, N.Z.	300,000
St. Catherines (Remodelled)	250,000	Todmorden	500,000	Rochdale	1,600,000
Kingston, Pa.	125,000	Saltley, Birmingham (Third Contract)	2,000,000	St. John's, Newfoundland	250,000
Peterborough, Ont.	250,000	York (Second Contract)	750,000	Brantford (Second Contract)	400,000
Wilkesbarre, Pa.	750,000	Rochester (Second Contract)	500,000	Smethwick (Second Contract)	500,000
St. Catherines (Second Cont.)	250,000	Newport (Mon.)	250,000	Pontypridd	250,000
Buffalo, N.Y.	2,000,000	Tokio, Japan	1,000,000	Montreal (Third Contract)	1,800,000
		Newcastle-on-Tyne	1,800,000	Guelph, Ont.	350,000
		Leeds	1,800,000	Buenos Ayres (River Plate Co.) Second Contract	750,000
				Belgrano (River Plate Co.)	500,000

And, in addition, COAL GAS PLANTS at NELSON, B.C., CHATHAM, BERLIN, NAPANEE, OWEN SOUND, CALGARY, and WINNIPEG

High-Pressure Gas Lighting in Birmingham.

The Birmingham Gas Committee have decided to improve the illumination of Victoria Square by means of an installation of high-pressure gas lighting. The system selected is that of Messrs. W. Sugg and Co.; and it will consist of burners and mantles capable of yielding a light of 1000-candle power from each of the lanterns in front of the Council House, on the islands, on the Town Hall side of the square, and on the Council House side of Congreve Street, as far as Edmund Street. The alteration will affect twelve of the triple lamps and eight of the single ones—making a total of 44. At present, the burners in these lamps are equal to 300 candles each; so that, instead of 13,200-candle power, the illumination when the change has been made will be equal to 44,000 candles.

Disposal of Gas Profits at Belfast.

Since 1874, when the Belfast gas-works were taken over by the Corporation, the total gross profits realized have amounted to £1,473,210, and the net profits (after allowing for interest and dividends) to £990,169. These have been allocated as follows: Extension of works, &c., £482,976; sinking funds, £181,734; depreciation of meters, stoves, and lamps, £62,921; insurance suspense account, £20,136; meter investment, £22,771; and extinction of retort-house stock, £2874. The payments made to the City Council have been: Parks Committee, £3813; Library Committee, £9550; Cost of Electric Lighting Order, £608; Electricity Committee, £32,500; borough fund, in aid of rates, &c., £74,264; new City Hall, £29,890; dials for memorial clock, £300; temporary Albert Bridge, £3500; cost of Finance Bill, £994. This makes the total disposed of £928,831, and leaves a balance at credit of net revenue account of £61,338. The quantity of gas made in the year ended June 30, 1875, was 418,234,000 cubic feet; while in the twelve months to March 31 last the output was 1,916,032,000 feet. In 1875, the price of gas was 4s. 6d. per 1000 cubic feet; but successive reductions had, in 1905, brought this down to 2s. 3d., less 10 per cent.—the meter-rents having meantime been abolished. In addition to this, consumers of between 200,000 and 400,000 feet a quarter have an extra 5 per cent. discount, while those using over 400,000 feet are allowed a further 5 per cent. reduction.

Shrewsbury Water Supply.—In consequence of the recent rejection by the ratepayers of Shrewsbury of the upland water scheme, the Town Council have, at the request of the Water Committee, assented to the expenditure of a small sum in improving the quality of the river water and increasing the pressure in the higher parts of the district. It is stated that the President of the Local Government Board, having had put before him all the circumstances of the case, would be prepared to give every assistance to the revival of the Water Bill rejected by the ratepayers; and that, as the matter is one of vital importance to the inhabitants of Shrewsbury, Parliament would allow the Bill to proceed in spite of the action taken by the ratepayers.

Price of Gas to Engine-Users at Oldham.—Last Wednesday, a deputation of users of gas for power and manufacturing purposes in Oldham waited upon the Gas Committee for the purpose of securing a reduction in price. Mr. F. Murphy, who acted as spokesman, said it was found that other towns supplied their gas at considerably less than the cost in Oldham. They thought they ought to have a reduction of at least 1s. per 1000 cubic feet, which the Corporation could well afford. Then as householders were supplied with free cooking-stoves, which were only used for about an hour a day in the summer, power users, who were continually consuming gas, argued that they were entitled as an equivalent to free gas-engines. If the reduction recently announced was the best the Committee could do, the manufacturers had practically decided to put down their own plant. It was for the Committee to make a reduction to prevent this. Alderman Hanson, the Chairman of the Committee, promised that full consideration should be given to the views that had been expressed.

A Salary Question at Stafford.—The Chairman of the Stafford Gas Committee (Mr. C. H. Wright), at the June meeting of the Town Council, gave notice on behalf of the Committee that at the succeeding meeting he would propose that the salary of the Gas Manager (Mr. Hubert Pooley) should be raised from £450 to £550 by two annual increments of £50. In the interim, a meeting of ratepayers was held, when a resolution was unanimously passed protesting against the recommendation of the Committee; and when the Council met last week, a report was read from the Gas Committee stating that the Manager had withdrawn his application for an increase of salary, and the Committee desired to withdraw their recommendation. Mr. Wright said the resolution of the public meeting had completely altered the position of affairs; and it would be absolutely idle on his part to underestimate the opinion expressed by that meeting. He moved that the Council approve of the course taken by Mr. Pooley in withdrawing his application under the circumstances, and express their confidence in him and in his management of the gas-works. Mr. A. Deakin seconded the motion; and it was carried unanimously.

Gas Lighting in Russia.—The Chairman of the Lodz Gas Company informed the shareholders at the recent meeting that, although the profits realized in the year 1905-6 were less than in the preceding financial year, owing to the unrest in Russia, it was solely due to the exceptional endeavours put forth to overcome interruptions in working that any profits whatever had been earned. At present the Directors are in negotiation with the Lodz City Council with a view to an extension of the existing agreement, though the prevailing political conditions render it uncertain whether a conclusion will be reached at an early date. In any case, the Company do not propose to accept a new contract which would not enable them to further work the business at a suitable profit; and if the demands of the city authorities exceed this limit, the present agreement, which has still three years to run, will not be renewed. The report approved at the meeting showed gross receipts of 742,685 roubles, compared with 710,571 roubles in 1904-5; and the net profits amounted to 176,378 roubles, against 190,329 roubles in the preceding year. A dividend was declared of 31 per cent. on the 900 preference shares, as contrasted with 34 per cent. in 1904-5.

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Cheaper Gas at Middlesbrough.—In moving the adoption of the Gas Committee's minutes at last week's meeting of the Middlesbrough Town Council, Mr. Roberts drew attention to the fact that the price of gas was being once more reduced by 1d.; making the charge 3s. 1d. per 1000 cubic feet, or with the discount off 2s. 3d. net.

Shortage of Water at Coventry.—During the past week, the inhabitants of Coventry suffered considerable inconvenience owing to a scarcity of water resulting from a breakdown of the pump at the Whitley works on the 6th inst. It appears that, in consequence of the growth in the population, the present sources are inadequate, and active steps are being taken to obtain others. Meanwhile, the Corporation are reported to have made arrangements with the Pulsometer Engineering Company for the hire of a pulsometer capable of lifting 26,000 gallons of water per hour, for the purpose of pumping at the Spon End well.

A 9-inch main belonging to the Pontypridd Water Company, which supplies Treforest, burst in Mill Street, Pontypridd, last Friday week; and before the supply could be cut off, several kitchens and cellars were flooded. The breakage was attributed to heavy traffic; and it was the second experienced by the Company within a week.

Orders have recently been placed with the Economical Gas Apparatus Construction Company, Limited, for installations of their carburetted water-gas plant at Guelph (Ont.), of a capacity of 350,000 cubic feet daily, and for the Buenos Ayres and Belgrano works of the River Plate Gas Company, having daily capacities of 750,000 cubic feet and 500,000 cubic feet respectively. The contract for the Buenos Ayres works is the second one placed with the firm.

A noteworthy feature in West of England finance, in the week closing on the 7th inst., was a heavy drop in the debenture stock of the South Wales Electrical Power Distribution Company, Limited. The meeting of the Company was held on the 2nd inst., when it was decided to issue £500,000 of prior lien debenture stock. The decision was followed by falls which totalled 13 in the week—one of 5 being on the 7th. On that day the stock stood nominally at 82¼. The debenture-holders held a meeting at the Cannon Street Hotel on Thursday, when a Committee was appointed to confer with the Board in regard to the future management of the Company and the satisfaction of its creditors, and also in respect to the terms and conditions of the issue of any prior lien stock or preference shares, the issue of which may be authorized by the Bill now before Parliament.

At the meeting of the Islington Guardians on Thursday, the Committees of the St. John's Road and Cornwallis Road Workhouses reported that they had considered a letter referred to them by the Board from the Gaslight and Coke Company asking for permission to prepare and submit a comprehensive scheme for a complete installation of incandescent lighting, which the Company suggested would give most satisfactory results. The Committees recommended that the permission asked for be granted. The School Committee reported that they had considered the same communication. They were of opinion that the present lighting arrangements had worked very satisfactorily; and as a large saving had been shown on the gas expenditure during the past two years, they recommended that no action be taken in the matter. The Board adopted the recommendations of the Workhouses Committees, and rejected that of the School Committee. The Company will therefore prepare a scheme for the whole of the buildings.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situation Vacant.

REPRESENTATIVE (Gas Stove Trade). No. 4623.

Report by Lighting Expert.

ANNFIELD PLAIN URBAN DISTRICT COUNCIL.

Situations Wanted.

MANAGER GAS AND WATER WORKS. No. 4624.
INSPECTOR. Advertiser, Islington.
REPRESENTATIVE OF GAS APPLIANCES COMPANY. No. 4625.

Plant, &c., for Sale.

GIRDERS, RIVETS, BOLTS AND NUTS, CONVEYOR AND ELEVATOR MATERIAL, TOOL STEEL, &c (Graham, Morton, Limited). G. Tinker and Son, Huddersfield. July 31 and Aug. 1 and 2.
BOILERS. Leatherhead Water-Works.
CONTRACTORS' PLANT FOR WATER-WORKS. Sheffield Water Department. July 25 and 26.
GAS-MAKING PLANT. H.M. Dockyard, Pembroke. Tenders by Aug. 15.

Company Meeting.

SOUTH METROPOLITAN GAS COMPANY. Cannon Street Hotel, Aug. 8, 2 o'clock.

TENDERS FOR

Coal and Cannel.

ATHERTON GAS DEPARTMENT. Tenders by July 25.

Condenser and Washer Scrubber.

RHONDDA GAS DEPARTMENT. Tenders by July 20.

Gasholder.

HAVERHILL GAS DEPARTMENT.

Purifiers.

RHONDDA GAS DEPARTMENT. Tenders by July 20.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

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All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.
Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

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For GAS PURIFICATION.
LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

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OLD BROAD STREET, LONDON, E.C.

WINKELMANN'S
"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
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Offices: Commercial Buildings, LEEDS.
Correspondence invited.

TEMPERLEY TRANSPORTERS
FOR Rapid and Economical Handling of Coal and Coke in Gas-Works.
Next Illustrated Advertisement will appear on July 31.
TEMPERLEY TRANSPORTER COMPANY,
72, BISHOPSGATE STREET WITHIN, LONDON, E.C.
Telephone: 365 LONDON WALL. Telegrams: "TRANSUMO."

AMMONIACAL Liquor wanted.
BROTHERTON AND CO., LTD., Ammonia Distillers. Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, AND WAKEFIELD.

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General Manager (for England and Wales)—
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WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS, AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 254 Oldham, and 2412 HOP, London.
Telegrams:—
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GAS OILS.
MEADE-KING, ROBINSON, & CO.
Represent the Strongest Independent Refineries in America; also Petroleum Spirit for Gas Enrichment. 18, EXCHANGE STREET, MANCHESTER, and 11, OLD HALL STREET, LIVERPOOL.

SULPHURIC ACID for Sale, specially suitable for making Sulphate of Ammonia.
BROTHERTON AND CO., LTD., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

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OVER 3000 INSTALLATIONS IN DAILY USE.
SEE illustrated advertisement in next week's issue.
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For all Joints in connection with Oil-Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

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Supplied by C. BOURNE, West Moor Chemical Works, Killingworth, near NEWCASTLE-ON-TYNE.

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Contractors for Complete CARBONIZING PLANTS and every description of GAS APPARATUS and ELEVATING and CONVEYING PLANT, ROSE MOUNT IRON-WORKS ELLAND.

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PATENTS AND TRADE MARKS
PUBLICATIONS, "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; SUBJECT-MATTER of PATENTS," 6d.
MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 and 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

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PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Exchanged for Spent Oxide.
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TO GAS-COOKER MANUFACTURERS.
ADVERTISER (Age 32 Years), late Re-presentative Gas Department, Carron Company, Stirlingshire, for Lancs. and Yorks., open for RE-ENGAGEMENT. Allied Trades invited.
Address No. 4625, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

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Address, "ADVERTISER," 24, Premier Buildings, Waterloo Terrace, Islington, LONDON.

WANTED, by young man having a Thorough Practical Knowledge of Gas Manufacture and Distribution in all its branches, a position as MANAGER of Works making from 10 to 15 Millions. Present post, Assistant Manager of Gas and Water Works. Excellent Testimonials. Total abstainer.
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LARGE Gas-Stove Firm require First-Class Man with Experience to REPRESENT them in Scotland and North of England.
Apply, by letter only, to No. 4623, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

THE Urban District Council of Annfield Plain require the services of a Competent Person to REPORT on the QUESTION OF THE LIGHTING of their District by Gas, for both Public and Private purposes.
Particulars may be obtained on application to the undersigned not later than the 21st of July, 1906.
By order,
T. L. WATCHMAN,
Clerk to the Council.
Council Offices, Annfield Plain,
July 6, 1906.

TWO Boilers, Cornish Type, for Sale. Each 5 ft. 6 in. diameter by 16 ft. 9 in. long, with Superheater and all Fittings. In good condition. Well suited for Gas or Water Works of moderate size.
Particulars on application to the SECRETARY, Water-Works, LEATHERHEAD.

"WOODITE," a Superior Substitute for RUBBER, LEATHER, &c., for Steam Joints, Gauge-Glass Rings. New GLAZIERS' DIAMONDS and GLASS CUTTERS.
Write to JAMES READ, 245, Whitehorse Lane, South Norwood, LONDON, S.E.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters. Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

GAS-MAKING PLANT.
TENDERS will be received up to the 15th of August next for the purchase of the GAS-MAKING PLANT at Pembroke Dockyard.
For details apply to the NAVAL STORE OFFICER, H.M. Dockyard, Pembroke Dock, SOUTH WALES.

THE Urban District Council of Atherton invite TENDERS for the supply of about 7000 Tons of Screened GAS COAL or NUTS from the 1st of August, 1906, to the 31st of July, 1907.
Forms of Tender and further Information may be had from the undersigned, to whom Tenders should be delivered on or before Wednesday, July 25 inst.
D. SCHOFIELD,
Clerk.
July 12, 1906.

HAVERHILL URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)
THE Haverhill Urban District Council invite TENDERS for the Construction and Erection on their Works of a 50 feet diameter GAS-HOLDER.
Full Particulars, with Conditions of Tender, can be obtained by application, in writing, at the Office of the undersigned, 29, Queen Street, Haverhill, Suffolk.
The Council do not bind themselves to accept the lowest or any Tender.
THOMAS BATES,
Clerk.
Haverhill, Suffolk,
July 7, 1906.

RHONDDA URBAN DISTRICT COUNCIL.
(GAS AND WATER DEPARTMENTS.)
THIS Council are prepared to receive TENDERS for the supply and Erection of a CONDENSER, WASHER, SCRUBBER, and Two PURIFIERS, at the Porth Gas-Works.
The Drawings and Specifications may be seen, and Forms of Tender supplied, upon application to Mr. Octavius Thomas, Engineer and Manager, Gas and Water Offices, Pentre, Rhondda, upon depositing the sum of One Guinea, which will be returned on receipt of a *bonâ-fide* Tender, but to be forfeited in the case of withdrawal of Tender after acceptance by the Council.
The Contractor will be required to pay the current rate of wages ruling in the district.
Tenders to be addressed to the Chairman of the Gas and Water Committee, endorsed "Contract No. 37," &c., and delivered at my Office on or before Ten a.m. on Friday, July 20, 1906.
The Council do not bind themselves to accept the lowest or any Tender.
WALTER P. NICHOLAS,
Clerk to the Council.
Council Offices, Pentre,
July 9, 1906.

SOUTH METROPOLITAN GAS COMPANY.
NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Cannon Street Hotel, in the City of London, on Wednesday, the 8th day of August next, at Two o'clock in the afternoon precisely, to receive the Directors' Report and the Accounts of the Company for the Half Year ended the 30th of June last; and to declare a Dividend for the same period.
The TRANSFER BOOKS WILL BE CLOSED from the 25th day of July inst., until after the Meeting.
By order,
FRANK BUSH,
Secretary.
Offices: 709, Old Kent Road,
London, S.E., July 14, 1906.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.
MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.
Terms for Issuing such Capital, and also for including Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at MR. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

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Re GRAHAM, MORTON, LIMITED.
TO BUILDERS, CONTRACTORS, ENGINEERS, CONVEYOR AND ELEVATOR MAKERS, AND OTHERS.
GEO. TINKER AND SON have received instructions from the Receiver and Liquidator and Committee of Inspection, to SELL BY AUCTION, upon the above premises, on Tuesday, Wednesday, and Thursday, the 31st of July, 1st and 2nd of August, 1906, commencing each day at Eleven o'clock a.m., the whole of the STOCK-IN-TRADE comprising:—
1200 TONS of STEEL GIRDERS, PLATES, CHANNELS, T's, ANGLES, FLATS, BAR IRON, and STEEL.
100 TONS of STEEL RIVETS, NUTS, and BOLTS
200 TONS of SCRAP IRON and STEEL.
CONVEYOR and ELEVATOR MATERIAL.
HIGH SPEED TOOL STEEL, &c.
Full Particulars in Catalogues (Price 6d. each).
Admission to view on and after the 23rd of July, by Catalogue only.
Also, at a later date, the whole of the PLANT, MACHINERY, AND TOOLS.
For any further Information apply to Messrs. ARMITAGE AND NORTON, Chartered Accountants, HUDDERSFIELD and LEEDS, or to the AUCTIONEERS.
Offices, Mart, and Repository, 23, Market Street, HUDDERSFIELD.

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COMPLETION OF LANGSETT RESERVOIR.
IMPORTANT SALE
OF
PLANT, MACHINERY, TIMBER, AND ACCOMMODATION BUILDINGS.
WEDNESDAY & THURSDAY, 25th and 26th JULY.
NICHOLSON, GREAVES, BARBER, & HASTINGS have been honoured with Instructions from the Water Committee of the Sheffield Corporation to SELL BY AUCTION, without reserve, at Langsett, on Wednesday and Thursday, the 25th and 26th of July, 1905, at Eleven o'clock precisely each day the following PLANT, MACHINERY, and TIMBER.
8-Horse Power STEAM NAVVY, by Ruston, Proctor, and Co.; 8-Horse Power PORTABLE ENGINE, by Clayton and Shuttleworth; VERTICAL BOILER; PUG MILL, by Johnson; 5-Ton STEAM CRANE, by Stothert and Pitt; 3-Ton STEAM CRANE, by Thos. Smith; HAND CRANES; Three STEAM WINCHES; ROTARY PUMP; Five PULSOMETER PUMPS complete with Pipes and Fittings; TWO WINDING DRUMS; a 20-in. by 10-in. CRUSHER, by Broadbent; COFFEE POT LOCOMOTIVE; 40-Horse Power LOCO. TYPE BOILER; 10,000 cubic feet of PITCH PINE; 200 Standards of TIMBER; WOOD CENTRES; CONCRETE SHOOTS; GALVANIZED PIPING; HEAVY CARTS; Nine DOBBIN CARTS; 200 End and Side TIP WAGGONS; Two MAIN LINE WAGGONS; 150 WHEELBARROWS; 20 Sets of HARNESS; ROCK DRILLS; PICKS; SHOVELS; and a great variety of STORES and GENERAL PLANT.
ALSO,
ACCOMMODATION BUILDINGS, comprising:—CANTEEN and KEEPER'S HOUSE; MISSION ROOM; HOSPITAL; Six WORKMEN'S HUTS, and CEMENT SHED.
Full Particulars will be given in Catalogues, which will be ready on the 14th of July, and can then be obtained of WM. TERREY, Esq., General Manager, Water Department, Town Hall, SHEFFIELD; or the AUCTIONEERS, 2, High Street, SHEFFIELD.
Langsett is 14 miles from Sheffield, 4 from Penistone, 5½ from Deepcar, and 2¼ from Hazlehead, all on the Great Central Railway.

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Rich in Illuminating Power and yield of Gas
Above the Average in Weight and Quality of Coke.
Maintains a High Standard in Residuals.
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CHESTERFIELD.